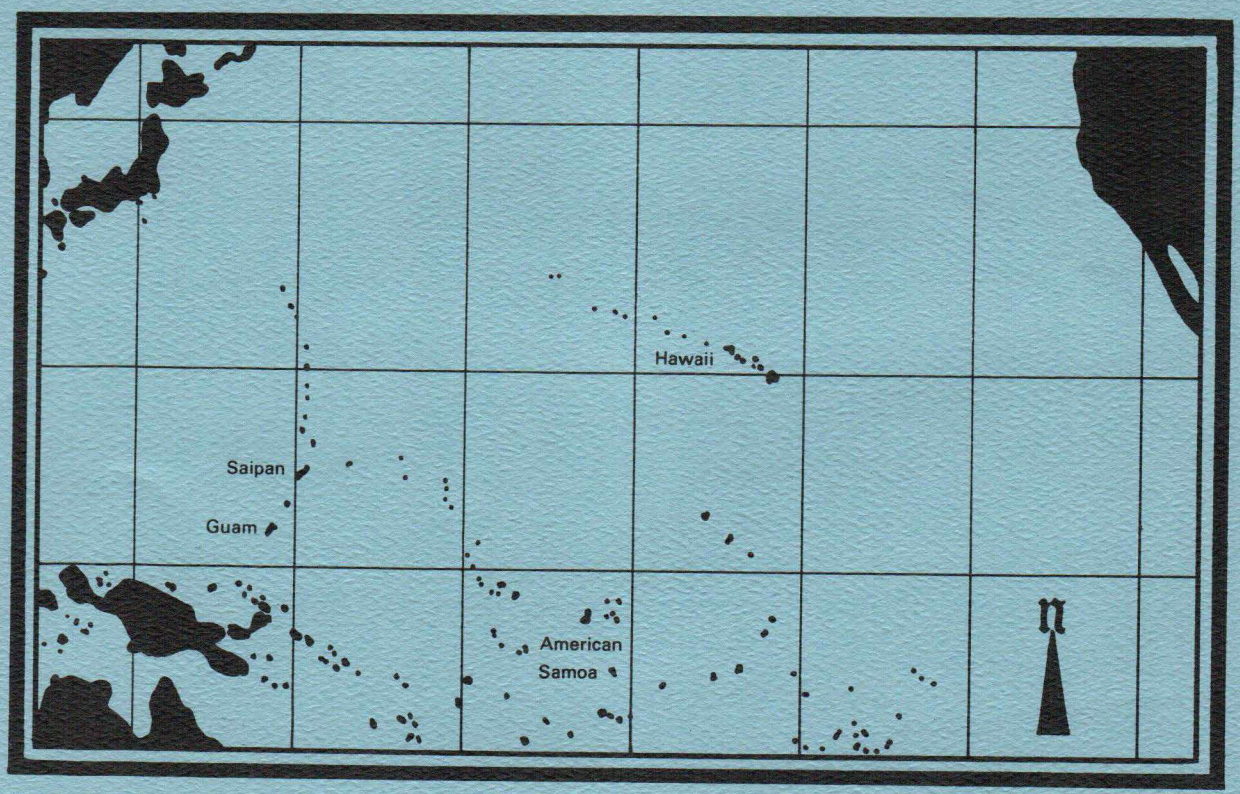
DEVELOPMENT OF THE AGRICULTURAL SECTOR IN THE AMERICAN-AFFILIATED PACIFIC ISLANDS

Shelley M. Mark

October 1982



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with the assistance of

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TABLE OF CONTENTS

PREFACE

This publication seeks to provide in a single reference, information on historical and political background, agricultural activities and constraints, federal and local government policies affecting agriculture, promising activities and opportunities, and policy implications for developing a more productive agricultural sector in the American-affiliated Pacific islands of Guam, American Samoa, and Micronesia.

It is structured and written to provide both historical background and additional detail to the previously issued HITAHR publication, Strategy Outline for Accelerated Agricultural Development of American-Affiliated Pacific Islands and may be regarded as a companion piece to the recently issued Development of the Agricultural Sector in Hawaii. It is directed toward planners, researchers, industry representatives, and government policy makers having responsibility for island agricultural development and University of Hawaii and U.S. researchers and administrators responsible for the design, selection, and funding of research projects and programs having applicability to these areas. This study, like the aforementioned publications, is based on the final report prepared under U.S.D.A. research agreement No. 58-9AHZ-9-474, Section 406, Food for Peace Act of 1966, entitled: Socio-Economic Criteria for Scientific Research to Improve Tropical Food Production Systems (with Particular Reference to American-Affiliated Pacific Islands). The cooperation of the Science and Education Administration of U.S.D.A. is hereby acknowledged.

The fuller report addresses the larger environments in which agriculture functions in the Pacific Islands. It provides a brief historical account of their cultural, political and economic development, and information on island location, climate, geology, and topography, and covers population trends, distribution and other demographic characteristics, income and welfare, family structure, land

tenure, and food preferences and consumption. Data on principal economic acitivities, external trade, labor force, prices, tax system, credit and capital markets, and physical infra-structure, including land, ocean, and air transportation systems, energy resources and costs, and communication systems are also presented. This particular report focuses on the agricultural sector. It gives an overview of island agriculture, including trends in production of major commodities, food imports and exports, and a description of the institutional and infra-structure of the agricultural sector; information on farms, social and economic characteristics of farmers, and marketing and distribution; and data on resources--land, labor, capital, water, soils.

Policy considerations and their implications for agricultural development are then taken up. These include local government plans and policies relating to agriculture, as well as federal policies and programs having direct or indirect effects on island agriculture. The final section summarizes the principal factors and conditions restraining agricultural development; identifies gaps and opportunities not currently being addressed by government plans and policies; and makes recommendations on priorities, policies, and the continuing planning process.

It is recognized that many gaps, inadequacies and perhaps even errors may be found in this study. The primary sources of data have been published studies, reports, official documents, and other materials. Personal contact was established with selected individuals in the local Governments, and a member of the project team was able to personally interview some of these persons in their home islands. Jerry Norris of the Pacific Basin Development Council facilitated communication and feedback on preliminary findings. Even so, the overriding pedagogic consideration of this effort has been the scarcity and uncertainty of information relevant to the issues at hand.

Thus, this report should be considered an initial profile document to be checked, updated, revised, and extended as necessary for future research and policy purposes. Nevertheless, the painstaking and often imaginative efforts of the research team should be recognized. Bruce Plasch helped develop the profile outline and conducted many of the field interviews; Ed Marcus, a former development planner for American Samoa, prepared the original materials for this island; Robert Lucas undertook a similar task for Guam and helped coordinate the overall research effort; Professor George Kent, a Pacific Islands specialist,prepared a monograph for the report to U.S.D.A. from which the material on agricultural development planning is drawn; Skip Polson contributed useful information on Micronesia; Shellie Kodama developed most of the material on the Northern Marianas and assisted in editing the entire manuscript. The senior author retains responsibility for inadvertent or undetected errors or shortcomings.

ABSTRACT

The report sets forth the premise that agricultural development may be the best means by which American-affiliated Pacific Islands (American Samoa, Guam, Trust Territories) can realize their goals of progressing economically in a manner consistent with their cultural heritage and social environments. Formidable natural and economic constraints, negative attitudes toward agricultural endeavor, and inappropriate Federal and territorial government policies stand in the way. Major policy changes in such areas as land and water use, production research and development, market facilities and development, infrastructure and institutional support, and planning will be required to enable progress toward long-term goals.

I. HISTORICAL AND POLITICAL BACKGROUND

A brief review of the historical and political evolution of the American-affiliated Pacific islands is provided in this section for those not familiar with the territories. Researchers and others who may become involved in projects or programs relating to the agricultural sector of these islands will thus be able to place agriculture's present situation in perspective relative to basic development influences.

A. Early History

While Guam and the Trust Territory of the Pacific Islands (TTPI) share a common early history due to their geographic proximity, American Samoa, being located nearly 3,000 miles away in the South Pacific, has a history uniquely its own.

1. Guam

The Mariana Islands were first settled about 1500 B.C. by a people who probably originated in Malaysia and became known as Chamorros. The first known Western contact occurred in 1521 when Magellan landed in Guam and the Spanish government was established. For the next 150 years, contact with the Spanish and other Europeans was very infrequent. Beginning in 1668, Spain actively started colonizing the islands, and soldiers and missionaries settled in Guam, strongly influencing and changing the ancient cultural patterns. For a while, the Chamorros resisted colonization and the forced conversion to Christianity. However, warfare and Western-introduced diseases decimated their population. Even after active resistance to Spanish domination ended, the population continued to decline, reaching a minimum of 1,500 in 1783.

By 1787, most of the ancient culture had been destroyed. During the next century to 1898, the population of Guam increased and new cultural patterns evolved. What remained of the indigenous population in 1783 gradually mixed with Spaniards and Filipinos who came to Guam, and to a lesser extent with other nationality groups who formed part of the Spanish military force on the island.

While adopting much of the Spanish, Mexican and Filipino culture that was introduced, the people of Guam retained some elements of the ancient Marianas culture. The Chamorro language survived, although much of the vocabulary became Spanish, and the self-sufficient household economy persisted. Subsistence agriculture, with the households as units of production was the basis of the Guam economy. Households were characterized by extensive kinship ties, incorporating

several generations and individuals who joined the household through marriage. Among households, there was much sharing and exchanging of food through "fiestas", which were frequently held for various social occasions, such as marriages and baptism. Relationships among households formed complex interlocking networks; the fiestas and other special occasions served to create and discharge social obligations between households and individuals.

2. TTPI

The islands of the Trust Territory of the Pacific share a history similar to Guam up until the time of Spain's defeat in the Spanish-American War. The islands were sold to Germany and remained in their possession until World War I.

When the Marianas were part of the Spanish territory, the islands were used as a stopover on the trade route between South America and the Philippines. Very little was done under the Spanish to improve the economic situation in the islands. The first major economic impact in the area came with the Germans. Although this period lasted only 15 years, the Germans were very interested in profiting from the sale of copra, and copra production and trade were greatly expanded.

The Japanese seized military control of the islands during World War I and later took formal control under a mandate from the League of Nations. Although the Japanese exploited the islands by turning them into armed fortresses, they also developed much of the infrastructure and agricultural resources. Immigration was encouraged to the point where the immigrants outnumbered the local inhabitants two to one. Extensive civil, military and commercial development took place with significant construction of roads, docks and water systems as well as military fortifications. Agricultural production reached the highest levels ever during this period, with most of the principal crops of sugar, rice, tapioca, coffee, papaya products, coconuts and pineapples being exported to Japan.

3. American Samoa

American Samoa is America's only territory in the South Pacific. It is populated by Polynesians said to be the least affected ethnically, among Pacific islanders, by centuries of exposure to traders, missionaries, men of war or fortune, and more recently, armies of mainland technicians. All of the Samoan people, American and Western Samoa, were once united as one people with a common heritage. Their presence in the islands has been carbon dated back as far as

FIGURE 1

Location of Guam

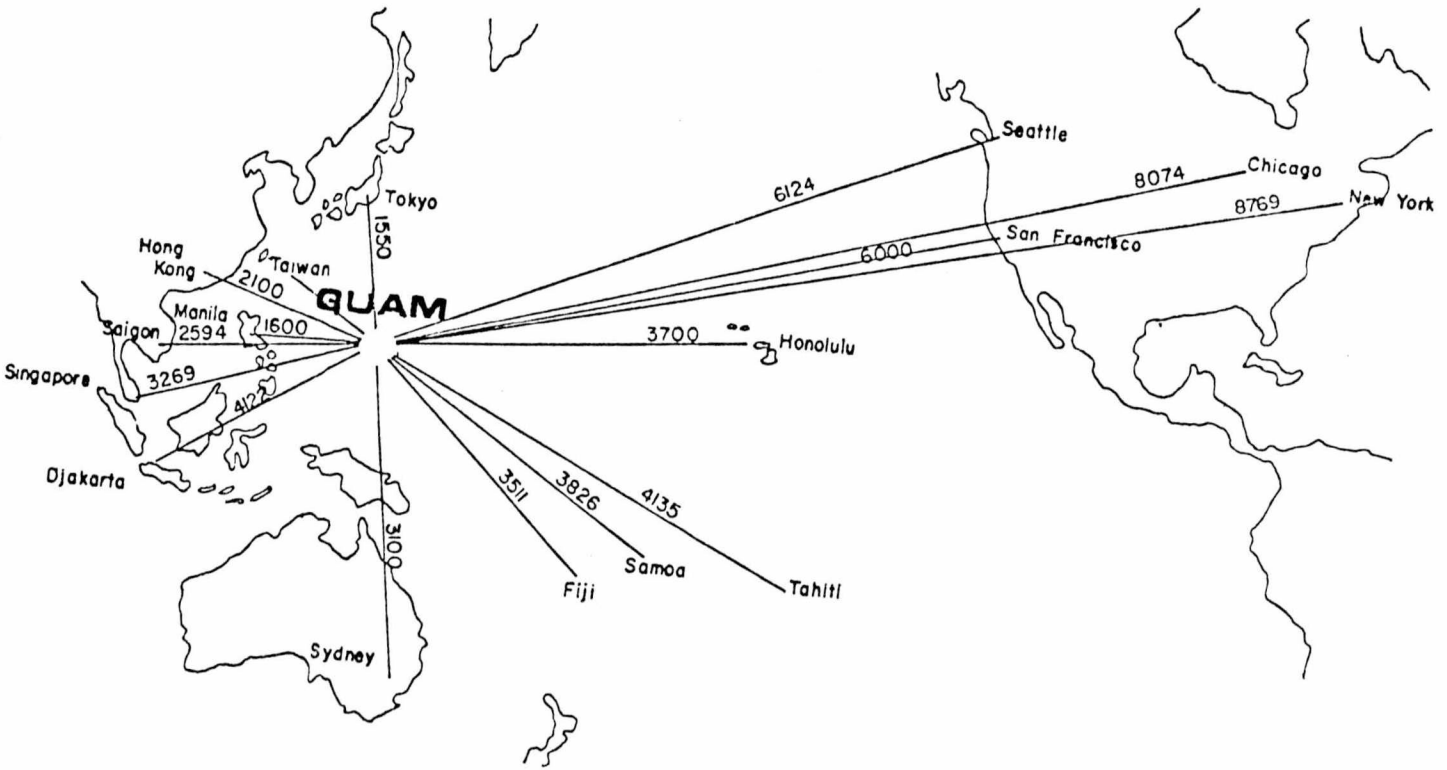


FIGURE 2

Location of the Trust Territory

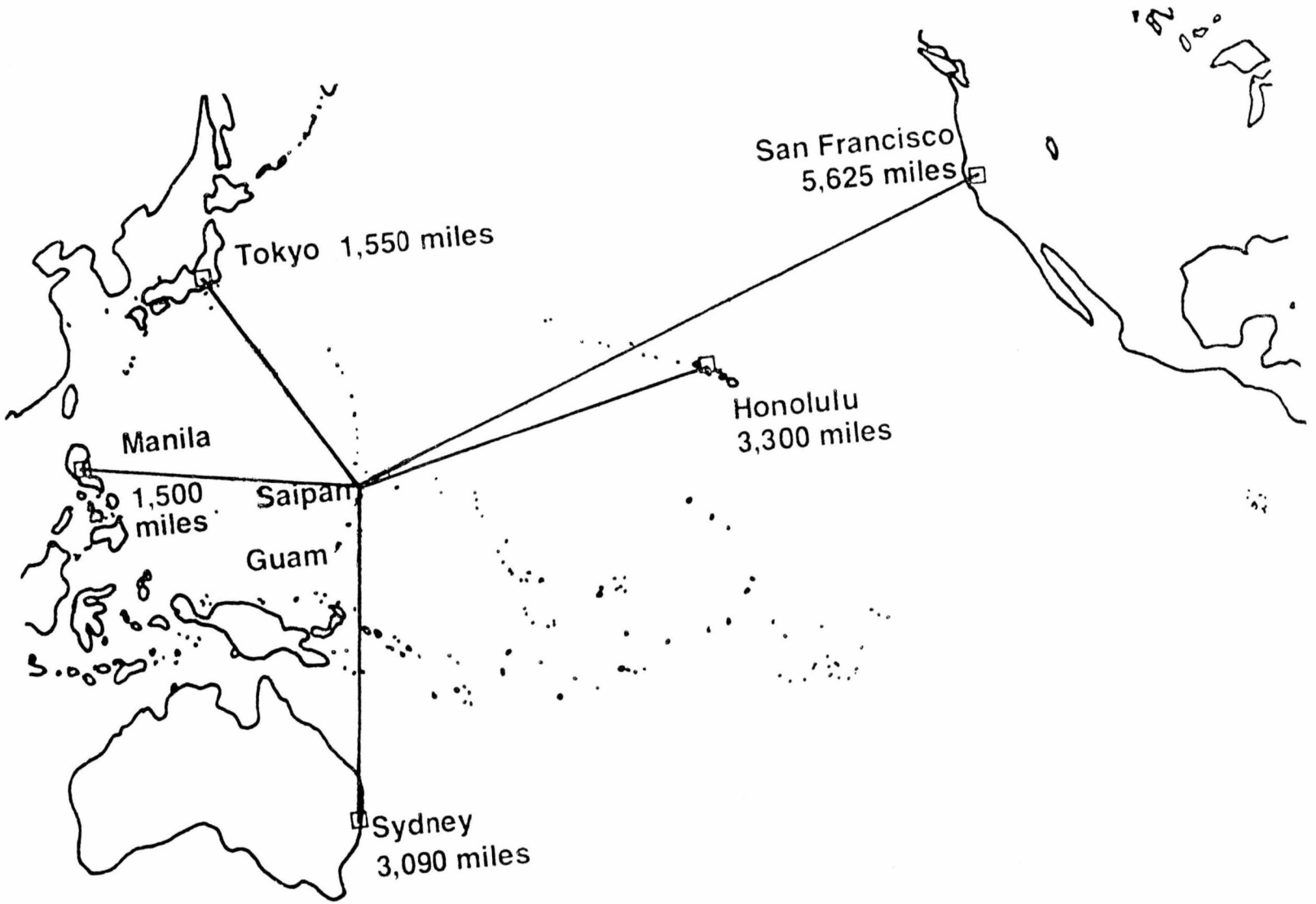
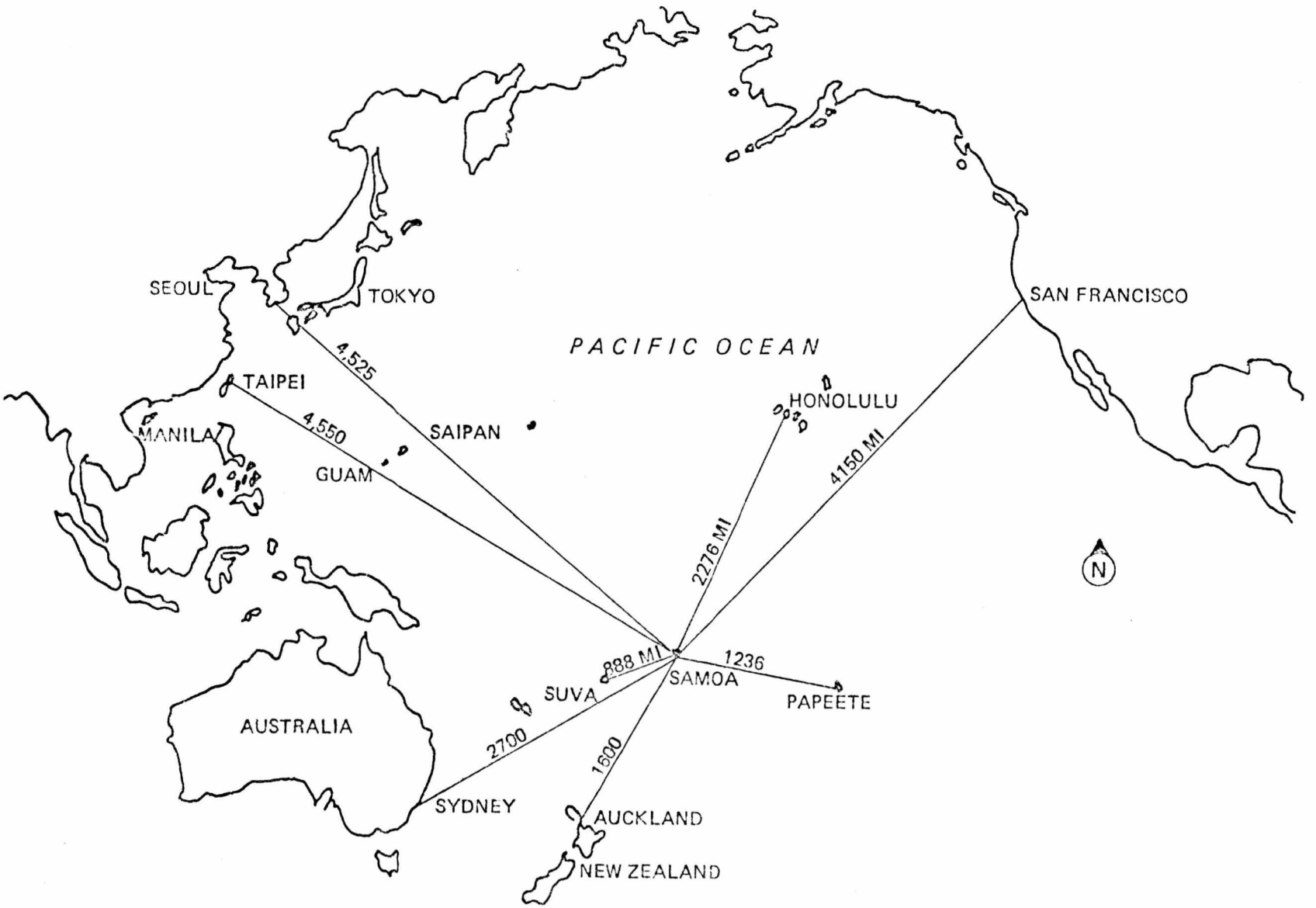


FIGURE 3

Location of American Samoa



500 A.D. According to anthropologists, Tutuila was probably the last island in the chain to be settled in significant number.

It was not until the turn of the century, when world powers with their new coal-powered navies discovered what is regarded as one of the best natural harbors in the Pacific, that American Samoa "came of age". Commander Meade sailed into Pago Pago in the year 1872 aboard the U.S.S. Narragansett and formed an agreement with the highest chief on the island, Chief Mauga of Pago Pago. This agreement, which dealt primarily with commercial regulations, was never ratified by the United States Senate; however, it did serve to prevent other nations from making claims on Pago Pago Harbor. Subsequently, there were a number of other attempts by Western powers to deal with the security of the Samoan Islands. These efforts culminated with the Convention of 1889, in which Germany and Great Britain agreed to drop all claims to the Samoan Islands that lie east of 171 degrees west of Greenwich, if the United States gave up all claims to the islands of Upolu and Savai'i, now the independent state of Western Samoa. This treaty was ratified, and on February 19, 1900, President McKinley directed the Navy to establish U.S. authority in what is now American Samoa.

After Eastern Samoa was ceded to the United States and a naval coaling station was established in the harbor, there was no significant growth in the population up to modern times. This is attributed to introduced disease, high infant mortality, and to a lesser extent, out-migration. The Naval governor ran the station with an ear to local problems, although once outside of the harbor area, local government which followed the traditional system was fairly much in control. The Samoan economic system was based primarily on an agrarian subsistence economy with occasional exports of copra and woven lafala mats.

B. Economic and Political Development under U.S. Jurisdiction

Spain, Germany, Japan and the United States have influenced and contributed to the economic and political development of Guam and the Trust Territory. American Samoa remained relatively isolated, up until the start of the 20th century. American influence in these islands has occurred mainly since that time, and more particularly after World War II.

1. Guam

In 1898, the United States took possession of Guam as a result of the

Spanish American War. The transfer of power to the U.S. in 1898 was peaceful, with little disruption of change taking place in the society that had evolved under Spanish rule. The economy continued to be primarily based on subsistence agriculture, but commercial copra production and wage work in military installations became available to a limited extent.

The Catholic Church continued to be an important part of community life. Although English became the official language for civil and business matters, Chamorro was still the principal language of the Guamanian population. Some Guamanian families established small businesses, and some young men joined the U.S. Navy. The U.S. Navy commander of the Marianas was the chief political administrator of Guam, virtually no participation in governance was extended to the Guamanians. Administered principally as a strategic naval base, Guam had practically no commercial or social relations with the rest of the world until World War II.

From December, 1941, to July, 1944, Japanese forces controlled Guam. The Japanese wartime administration was severe, with many people being drafted to work as forced laborers. The reoccupation of Guam in 1944 was heavily resisted by the Japanese, and much of Agana and other urbanized areas were destroyed before the fighting ended in August, 1944. The end of World War II marked a major turning point for the Guamanian society.

After the war, political and economic changes came quickly to Guam. Navy Department administration was replaced by civilian administration in 1946, but entry into Guam continued to be controlled by the military establishment. In August, 1950, the Organic Act of Guam was signed into law by President Truman, and for the first time, a significant measure of self-government was granted. Under the Organic Act, Guam became an unincorporated territory of the U.S., and Guamanians became American citizens. The Act provided for a territorial governor to be appointed by the President and stipulated that locally collected Federal income taxes be given to the territorial government.

Together with the Organic Act, opening Guam to the outside world was probably the most important event since the end of war. Military control of access to Guam was lifted by 1962, and Guam was able to begin establishing commercial and social relations with other areas. In 1976, the U.S. Congress passed Public Law 94-584 enabling Guamanians to write their own constitution. Guam's constitution was drafted in 1977; and was approved by President Carter in 1978. Upon ratification by a majority of the voters of Guam, the new consti-

tution will replace the Organic Act of Guam.

2. TTPI

During World War II, most of the infrastructure developed by the Japanese was destroyed. In 1947, a trusteeship agreement between the U.S. and the United Nations designated the islands a Strategic Trust Territory of the United States. Under the agreement, the Americans through the Navy Department were allowed to fortify the area, apply appropriate laws, and maintain veto power over proposals dealing with changes in the status of the trusteeship agreement, with a view toward eventual self-government. The U.S. Department of Navy was authorized to set up the civilian administration of the territory, but authority eventually was relinquished to the Department of Interior. The military needs of the Korean War delayed the Northern Marianas' transfer until 1962.

The American administration of the Trust Territory of the Pacific islands has focused on capital investment and public assistance programs. These efforts have been criticized among the islands for producing economies overly dependent on U.S. financial aid and life styles which may not be wholly appropriate for the cultural and economic background of the residents.

3. American Samoa

American Samoa became the staging area for U.S. troops who were destined to participate in the theaters of war in other island groups of the western and southwestern Pacific. Samoa was well situated for such use; in addition to the excellent harbor, it lies at an east-west and north-south crossroads in a vast expanse of the South Pacific that has limited accessible landfalls.

The number of American forces bivouaced in the valleys and coves of Tutuila at the peak of the Pacific War was about equal to the native population - or approximately 12,000. The war years represent the first accelerated era of social and economic change. Many of the young Samoan men were enlisted in a special group of the Navy called the Fita Fita Guard. They learned skills related to naval activity and acted somewhat as a home guard. Wages were minimal, but a pattern of work for wages was established. This change was particularly apparent on the island of Tutuila and more specifically within the Bay Area.

However, the first annual report of 1952 to the Secretary of Interior by a Washington appointed governor did not paint a very positive picture of overall

conditions in the Territory. A major problem cited in this report was the overwhelming desire of the population to work for wages. The Samoan chiefs, it was reported, insisted that a U.S. recruiting office be opened in Samoa so that their young men could enlist. This first report to Interior also laments the lack of agricultural activity and the absence of any interest, particularly on the island of Tutuila. Agricultural development, the report points out, was not an official government activity until 1932. The Territorial budget during the last five years of that decade (1956-1960) totaled only 18 million and of this total, only $396,000 was budgeted for agriculture.

Early in 1961, American Samoa was the subject of an article in the Readers Digest titled, "American Samoa, The Shame of America," which caused a flurry of publicity and a certain amount of attention from the United Nations. A new governor was appointed and a new era of social, economic and political development for these small South Pacific islands began.

C. Present Political Status

The degree of association that each island has with the U.S. varies with the territory. Each area also has its own unique system of local government.

1. Guam

The Guam constitution provides for a government structure similar to that of the United States. The executive branch is headed by a locally elected governor, the first governor taking office in 1970. The legislative branch of Guam is unicameral and is presently comprised of 21 senators, each elected to a two year term. The senators are elected from four political districts. The judicial branch consists of a supreme court and a superior court. Guam also elects a representative to the U.S. Congress who has voting rights in the House committees and sub-committees to which he belongs, but no vote on the House floor. As under the Organic Act, Guam remains an unincorporated territory of the U.S.

2. TTPI

Negotiations to conclude the trusteeship began in 1969. Initially, the Micronesian representatives explored the idea of becoming an associated territory, in which the people would have an internal self-government and the United States would retain defense and foreign affairs responsibilities. There

was also some interest in complete independence from the United States. However, the failure of all districts to reach a concensus on their political status prompted some groups to seek separate negotiations, the Northern Mariana Islands were the first to do so. In April, 1976, the Northern Mariana Islands began to prepare for their United States Commonwealth status by developing their constitutional government and electing a governor and legislature. Until the formal termination of the trusteeship, they have only administrative control of their government under the formal title of the Commonwealth of the Northern Mariana Islands (CNMI).

Belau, the FSM, and the Marshalls are each expected to establish a relationship of "free association" with the U.S. In return for certain budgetary support to the new governments and some U.S. government services (such as postal and aviation services), the U.S. will have exclusive use rights to certain parts of the area for military purposes as well as the right to deny access to any other nation's military forces.

Each island group has its own constitution and currently has a large degree of self-government. However, they will remain part of the Trust Territory of the Pacific Islands until the trusteeship is officially terminated.

3. American Samoa

By 1951, when memories of the battles of the Pacific had faded, the Naval administration of American Samoa came to an end. A reorganized Office of Insular Affairs in the Department of Interior asserted its right--with congressional approval--to administer the American Samoa Territory, as well as Guam and the Trust Territories.

The present governor of American Samoa became the Territory's first appointed Samoan governor--and in 1978 the first to be popularly elected. He initiated frequent and direct appeals to Congress for program assistance in American Samoa and is credited with establishing the social security program in the Territory, as well as initiating some of the major infrastructural activities that exist today.

II. OVERVIEW OF THE AGRICULTURAL SECTOR

A. Agricultural Trends

The lack of solid statistical data makes difficult the assessment of agricultural trends or development in the islands. However, the tendency has been for agriculture to play a less important role as time progresses--acreage and production have declined, while population has increased.

1. Guam

Before World War II, Guam was largely self-sufficient in food production. Despite some problems in comparability, the data presented in Table 1 documents the decline in agricultural production that occurred in the post-war period. For example, in 1940, there were 64,898 acres of land in farms (Table 1) compared to 28,619 acres in 1978. Probably the most revealing comparative figures are those for total vegetable and field crop production and the number of coconut trees harvested.

In 1939, 4.7 million pounds of field and vegetable crops were harvested in Guam, compared to 1.3 million pounds in 1978. The 1939 figure excludes 10,860 bushels of rice and the quantity of taro grown on 724 acres of land for which no harvest amount was reported in the census. Using assumed yield figures, these omissions would amount to an additional 1.37 million pounds, or a total of about 6.1 million pounds of crop production for 1939.

In terms of tree crops, the production of copra from coconuts was a large industry. In 1940, 885,424 coconut trees were harvested, compared to 241,816 trees in 1950, and 50,046 trees in 1975. During the 1935-1939 period, copra exports averaged 4.5 million pounds per annum. The data also indicate that coffee, bananas, pineapple, and breadfruit trees were much more numerous in 1940 than in subsequent census years.

These data should also be assessed in terms of population changes. In 1940, the census reported 22,290 persons resident in Guam, whereas by 1970, the Guam population had grown to 84,996.

2. Trust Territory of the Pacific Islands

The acreage, production and value of the agricultural sector are

TABLE 1

Historical Trends in Guam Agriculture

	1930	1940	1950	1960	1970	1975	1978
Number of Farms	2,104	2,529	2,262	2,028	1,121	1,576	1,999
Total Land in Farms (acres)	n.a.	64,898	24,772	32,108	26,158	29,765	28,619
Vegetable & Field Crops Harvested (acres)[1]	n.a.	3,823	1,097	904	724	961	684
Vegetable & Field Crops Production (lbs.)[1]	n.a.	4,711,531	1,241,029	1,237,067	1,262,991	1,451,019	1,278,924
Avocado[2]	n.a.	10,220	1,870	2,798	3,244	8,055	2,503
Breadfruit[2]	n.a.	36,615	12,405	n.a.	1,983	2,144	1,196
Coconut[2]	n.a.	885,424	241,816	n.a.	46,461	50,046	8,148
Coffee[2]	n.a.	90,254	7,968	232	--	--	--
Banana[2]	n.a.	535,240	142,222	153,687	62,193	94,317	93,088
Papaya[2]	n.a.	7,719	2,211	6,643	3,292	18,011	6,602
Pineapple[2]	n.a.	134,263	35,603	77,816	5,544	4,028	8,948
Cattle	6,948	5,840	2,847	5,860	5,300	5,294	2,990
Hogs & Pigs	7,616	14,089	7,056	7,118	4,348	8,245	8,474
Chickens	154,784	209,465	132,731	137,071	126,636[3]	302,328[3]	246,854[3]

[1]Data is for the year previous to that stated in category.
[2]Number of trees or plants harvested.
[3]Excludes chickens under 4 months old & roosters & pullets.

Source: U.S. Census of Agriculture, Guam various issues.

poorly documented. This is due, in part, to inadequate recordkeeping and also because much of the agriculture practiced is subsistence farming and does not enter the market. However, by examining government agricultural sales statistics, it appears that the Commonwealth of the Northern Marianas has the most commercially oriented agricultural sector of the Trust Territory islands. It is also estimated that this sector provides employment to the greatest number of households, although primarily on a part-time basis and often augmented by government employment (through the extended family).

The agricultural sector is characterized by family farming supplemented by fishing, with most of the production for home consumption. For the most part, farming is not seen as a full-time occupation or as a major source of family income. Although there are a few purely commercial operations for the production of fruit, vegetables, livestock and timber, these are far from fully developed. During the Japanese occupation of the islands, agriculture was the most important sector of the economy. By 1937, nearly one-third (36,900 acres) of the total land area was under cultivation. Rice, sugarcane, papaya, tapioca, cacao, coffee and other crops were grown in the islands; vegetable production alone was recorded at 19,900 tons that year and fruit production was 460 tons. Farm livestock was estimated to include 24,100 swine and 14,600 cattle. Agricultural activities have declined greatly in the Northern Marianas since the end of World War II because of Japanese repatriation and, more recently, because of better employment opportunities in the government and private sector. Table 2 summarizes recent trends in agricultural production.

Presently, only about 600 acres are under cultivation in the CNMI, and no more than 22,500 acres are in grazing. There are fewer than 75 full-time commercial farmers in the Commonwealth.

Sales of crops grown in the Commonwealth have been steadily declining since the end of World War II. During FY 1979, only 547,000 lbs. of vegetables and 70,000 lbs. of fruit were sold--cucumbers, watermelons and other melons making up the bulk of this volume. Domestic buyers include hotels and retail stores, while local military facilities and retail stores in Guam are considered

TABLE 2

Historical Trends In
Trust Territory Agriculture

	CNMI	Belau	Yap	Truk	Ponape	Kosrae[1]	Marshalls
CROP ACREAGE:							
1970	5,008	4,254	7,558	26,427	33,615		22,172
1974	6,049	4,141	7,806	21,540	35,514		26,294
1977	1,105	4,299	6,726	11,739	23,701	2,819	27,334
Vegetable:							
1970	155	46	130	230	185		85
1974	104	20	15	100	120		2
1977	375	42	2	10	10	10	--
Fruits:							
1970	387	177	801	2,913	2,119		494
1974	347	158	384	2,303	2,303		375
1977	432	104	215	761	761	551	304
Staple Crops:							
1970	326	1,217	1,154	7,421	4,546		562
1974	395	1,190	1,201	10,976	4,934		481
1977	326	1,270	462	2,839	1,786	649	700
MARKETED PRODUCTION:		('000s lbs.)					
1970	39	168	17	8	76		18
1974	1,353	248	1,442	7,089	4,389		12,801
1977	1,938	490	818	3,077	3,314	1,218	1,218
Vegetables:							
1970	1,594	68	15	99	64		7
1974	8,824	46	9	55	109		8
1 1977	16,569	40	7	22	68	31	6
Fruits:							
1970	105	253	137	1,108	137		270
1974	365	16	25	40	290		10
1977	985	44	13	10	110	40	40
Staple Crops:							
1970	1,297	3,683	1,441	2,131	6,880		320
1974	1,057	52	105	31	264		108
1977	1,828	72	77	15	131	20	72

[1]Kosrae included in Ponape prior to 1976.

Source: TTPI Annual Report to United Nations, 1977.

export buyers. Almost half the vegetable production is exported to Guam. These include cucumbers, watermelons, cantaloupes, honeydew, sweet melons, beans, daikon, radishes, green onion, okra, pumpkin, squash and bittermelon. Very little copra production takes place in the Northern Marianas because of destruction during the war and the coconut beetle infestation.

Most of the fruits are consumed locally (within the district) but almost a quarter of the production was exported. Fruits grown in the Northern Mariana Islands include bananas, papaya, mango, avocado, oranges, tangerines, lemons, pineapple, soursop, sugar apple and star fruit. Fruit production seems to be especially susceptible to crop loss due to storms as evidenced by the low production in 1970, 1977, 1978 and 1980.

Much of the staple crops are consumed at the subsistence level (as in 1977 when 356,133 lbs. were produced; 86,634 lbs. were marketed; 96,331 lbs. were exported and the rest consumed by producers or given away). Staple crops include yams, taro, cassava, breadfruit.

Sales levels of animal products have generally been variable; meat sales have fluctuated between 200,000 lbs. and 450,000 lbs. over the past seven years and milk production surpassed one million pounds in FY 1979. Livestock consists of approximately 2,500 swine and 7,300 cattle. Most of the cattle are on a 7,000 acre ranch on Tinian owned by the Micronesian Development Coporation. All milk and almost all meat sales are generated by this ranch, with the major proportion of production being exported to Guam. Meat and pork production can be expected to increase because of improved breeding and management, and because the Japanese export market has recently been opened. Prices in this new market will hopefully help to offset increasing feed prices and utilize the expansive grazing land in the Northern Mariana Islands.

Very little sector-specific information is available in statistical form with regard to the rest of the TTPI. Production was high in the early 1970s but has since dropped dramatically. Staple crops were the most extensively grown marketed commodity. But most of the agricultural effort in the area is devoted to subsistence production for family consumption. Very few statistics about the size of subsistence production exist.

3. American Samoa

An accurate account and analysis of agricultural activity is made difficult by the lack of reliable and consistent reports and statistics. In view of

this void, the available scattered data have been combined into a single table to facilitate detection of trends and analysis of agricultural activity. (Table 3).

Total acres planted in crops, including tree crops such as coconut, range from 10,000 to 12,000 acres for the years 1952, 1966 and 1968. For 1967, an estimated 7,500 acres were in coconut trees. Since coconut trees are a reasonably stable crop, one can assume that this estimate would not change significantly over a 20-year period. (In the absence of a replanting program, it has undoubtedly decreased since 1967.) Further, assuming that the balance of acres planted (12,000 minus 7,500) represents the acreage of all other crops, it would appear that during the peak of agricultural activity, the Territory had from 4,000 to 5,000 acres in crops other than coconut.

While there is some evidence that agricultural activity declined from the early '70s onward, there is little indication of the total acreage in crops today. Indications are that following an increase in the early '70s, the result of an effort to encourage new production, there has been a decline in total acreages. Current estimated acreage, excluding coconut, would thus be less than that during peak activity -- somewhere in the range of 2,500 to 3,500 acres.

B. Food Imports and Local Production

As has been suggested, importation plays a significant role in the acquisition of foodstuffs for these islands. Included in this section is a brief discussion of the share of local agricultural production in food consumption in some of the islands.

1. Guam

Little published data exist on civilian food imports. Statistics on military food imports are not available to the Government of Guam and apparently are not published. The available data for the period 1970-1975 and 1979 on civilian food imports are examined in this section, together with the share of local food production relative to total consumption.

Table 4 gives data on the major Guam food imports. Over half of the total dollar value of these commodities in fiscal year 1970 came from the United States. With respect to selected commodities, the United States, Japan and the Trust Territory were the major suppliers of fruits and vegetables.

TABLE 3

Historical Trends in American Samoa Agriculture

	Recorded Production, Sales, or Consumption (lbs.)						Other Production	
	Taro	Banana	Coconut	Breadfruit	Vegetable	Acres Planted	Eggs (dz)	Fryers
1962	40,000 (M)					6,255 (T)		
1964	40,000 (M)	68,000 (M)		39,000 (M)	2,000 (M)			
1965	83,000 (M)	445,840 (M)			82,000 (G)		24,000	2,500
1966	113,000 (M) 53,000 (G)	560,109 (M)			125,000 (G)	12,000 (T)	35,000	2,500
1967	47,000 (G)			10,000 (papaya)	145,000 (G)	7,500 (coconut)		
1968	7,473,000 (C)					12,000 (T)		
1969	505,000 (M)	153,000 (M)		90,000 (M)	42,000 (M)	680 (TR)		18,000
1970	552,000 (M)	500,000 (M)	944,000 (M)	142,000 (M)	113,000 (M)	680 (TR) 140 (B)		
1971	715,000 (M)	932,000 (M)	236,500 (M)	298,000 (M)	704,000 (M)	444 (TR) 400 (B)		
1972	925,000 (M)	1,110th (M)	362,000 (M)	365,000 (M)		340 (TR) 186 (B)	75,000	12,000
1974	540,000	1,250th						
1975							31,000	15,000

Source: Annual Reports 1962-1977

(M) = Marketplace Sales
(G) = Government Farm Production
(T) = Total Estimated All Crops
(C) = Total Annual Consumption
(TR) = Taro
(B) = Banana
(th) = thousand

TABLE 4

Guam Production & Imports: Selected Commodities
('000s lbs.)

	1970		1975		1979[1]
	Production	Imports	Production	Imports	Imports
Fruits & Vegetables	2,411	6,353	3,750	7,940	10.5
Beef	242	3,070	116	3,908	8.8
Pork	412	1,641	997	1,766	2.5
Poultry	195	2,249	258	2,510	4.9
Eggs	2,150	328	2,500	1	n.a.
Fresh Fish	151	708	n.a.	n.a.	2.8

[1] in $'000s.

Sources: Guam Agriculture Plan.
Unpublished trade statistics supplied by Economic Research Center, Guam Dept. of Commerce, January 1981.

The United States alone supplied 57% of the total pounds of fruits and vegetables imported, while the next largest supplier, Japan, accounted for 24%. Guam was largely self-sufficient in eggs in 1970 and by 1975 had become completely self-sufficient. However, in terms of poultry (virtually all chicken meat), Guam has been heavily dependent on imports. For pork, the same was true; almost all imported pork came from the United States in 1970; and in this year, Guam was importing 80% of the estimated total civilian consumption. In regard to beef, the United States supplied only 19% of total imports, and the largest supplier was New Zealand. In 1970, the major sources of fresh fish imports were the United States, Trust Territory and Japan, in that order. However, in 1971, the Trust Territory's share declined substantially. While Guam appears to have made progress toward self-sufficiency in terms of eggs and pork, and to have held an approximately stable share (at about 30%) in fruits and vegetables, it was almost totally dependent on imported beef and chicken meat.

Food imports for calendar 1979 are in dollar terms. Total food imports amounted to $56.9 million, or 12.8% of total Guam imports of $445.8 million. In order of dollar volume, the United States, Australia, Japan, and the Philippines were the major suppliers of food. By comparison, the Trust Territory and the Commonwealth of the Northern Marianas exported $0.835 million to Guam, mainly beef, dairy products and fish.

The largest specific food import commodities were: beef ($8.8 million), poultry ($4.9 million), pork ($2.5 million), rice ($3.6 million), fresh and frozen fish and shellfish ($4.6 million), fresh fruits ($3.8 million), fresh vegetables ($3.7 million), and processed fruits and vegetables ($2.8 million). In 1979, the total local production of fruits and vegetables, poultry, pork, beef and eggs amounted to $6.9 million, or 10.8% of total civilian food imports and local production (Guam Department of Commerce, August 1980).

From these data, it is evident that Guam still relies very heavily on imports to supply its food requirements.

Per capita consumption figures for Guam are presented in Table 5 for fiscal year 1975, together with comparison figures for Hawaii and the United States. For fruits and vegetables, total Guam per capita consumption amounted to 151.6 pounds, compared to 237.0 pounds in Hawaii, and 318.0 pounds for the

TABLE 5

Comparison of Per Capita Consumption of Selected Commodities
in Guam, Hawaii and the United States: FY 1975
(in pounds)

Commodity	Guam		Hawaii /2		United States
	Per Capita Total Consumption	Per Capita Consumption of Local Production	Per Capita Total Consumption	Per Capita Consumption of Local Production	Per Capita Total Consumption
Fruits & Vegetables (fresh) /1	151.6	48.6	237.0	94.2	318.0
Pork	32.0	12.0	34.0	9.1	51.2
Beef and Veal	52.2	1.5	99.6	31.2	92.4
Chicken Meat	35.9	3.4	28.8	6.5	40.6

/1 As potatoes could not be broken out of the Guam figure, they have been included in the Hawaii and the United States figures; without potatoes, Hawaii's per capita figures for total and local consumption would be 202.6 and 89.5, respectively, and the United States figure would be 197.7.

/2 Per capita figures for Hawaii were calculated on the basis of total de facto population minus military personnel in uniform as of July 1, 1975, and for Guam the population figure is from Table 4-1 (local residents, stateside hires, and temporary aliens, or 77,100) for September 1975.

Source: Guam--Hong K. Sohn, A Public Market Feasibility Study, 1977, Table 4.11.
Hawaii and the U.S.--(a) Hawaii Agricultural Reporting Service, Statistics of Hawaiian Agriculture 1979, pp. 13, 37-40, 72 and 78; (b) State of Hawaii Data Book 1976, Table 3.

United States as a whole. It should be noted that these figures include potatoes, which in the case of the United States amounted to 120.3 pounds. Potatoes could not be separated from the Guam data, but for Hawaii, total consumption of fruits and vegetables (excluding potatoes) would amount to 202.6 pounds and per capita consumption of local production would amount to 89.5 pounds. The data suggest that total consumption of fresh fruits and vegetables in Guam would probably increase if local supply could be expanded at competitive prices. Also, if market share of local production in Guam (at 32% compared to about 40% for Hawaii) could be increased, this would add considerably to potential demand for local products.

With respect to pork, both Guam and Hawaii consume less per capita compared to the United States as a whole, and local production as a share of total consumption in Guam (40%) and Hawaii (27%) is less than 50%. Again, compared to the United States average, it would seem that good potential exists for increased pork production in Guam.

Beef and veal consumption in Guam, at 52.2 pounds per capita, is considerably less than that of Hawaii (99.6 pounds) and of the United States (92.4 pounds). Since over 95% of Guam's beef and veal is imported, and local production has declined both in absolute as well as relative terms, the potential for increasing local production will depend on the uncertain prospects of developing new sources of lower cost feed and establishing cattle feedlot activities.

In terms of chicken meat, per capita consumption is not too far below the United States average and is higher than that of Hawaii. The high cost of imported feed is a large factor which constrains local chicken meat production.

2. Trust Territory of the Pacific Islands

Available import data for the TTPI are summarized in Table 6. Total imports of food, live animals and beverages for the Trust Territory have been calculated at $12,973,000 in FY 1977 and $13,167,000 in FY 1978; or 32.3% and 33.9% of all imports, respectively. Major items of food imports are rice, flour, sugar, canned meat, canned fish, frozen meat, marine products and fresh agricultural products; beverages include beer, alcohol, milk and other assorted beverages. Consumption of rice is especially high in the Marianas. Major food items imported in the Marshalls were flour and sugar; in Ponape, canned meat and fish were imported the most.

TABLE 6

Major Food Imports for
Trust Territory of the Pacific Islands
($'000s)

	1970	1974	1977[1]	1979[2]
Rice	1,426.1	2,436.1	1,954.2	n.a.
Flour	563.4	441.2	509.7	n.a.
Sugar	581.7	774.9	952.4	n.a.
Canned Meat	1,078.3	1,264.3	920.0	n.a.
Canned Fish	957.6	946.9	n.a.	n.a.
Other Food	2,380.5	5,059.8	3,971.9	n.a.
TOTAL FOODSTUFF	6,987.8	10,924.1	20,220.8[3]	11,008.0
Milk	1,221.2	978.1	409.8	n.a.
Beer	438.7	1,601.9	n.a.	84.0

[1]Excludes Northern Marianas.

[2]Data is for Northern Marianas, only.

[3]Includes beverages.

Sources: TTPI Annual Report to Secretary of Interior, 1970 and 1974.
TTPI Annual Report to United Nations, 1979.
Report to Congress on Agriculture Development Strategy.
CNMI, Division of Revenue.

The Commonwealth of the Northern Marianas also receives food from the United States Department of Agriculture for school lunch programs and the Needy Family Program. For FY 1980, this amounted to 465,634 lbs. of meats, fruits, vegetables, grain and dairy products for the school lunch program and 5,217,831 lbs. of the same food categories for the Needy Families Program.

3. American Samoa

Table 7 presents recent data on Territorial imports and marketplace sales and provides a basis for estimating trends in local production. During the years 1970 through 1972, there was a noticeable reduction in imports and a simultaneous increase in marketplace sales; increased marketplace sales may be attributed to increased local production. On the other hand, if increases in food imports are considered a concomitant of decreased local agricultural productivity (as well as a measure of improved economic conditions), the subsequent rapid increase in dollar value of food imports supports the evidence of decline in farming activity.

In 1968, American Samoans consumed an estimated 7.5 million pounds of taro; an estimated 53% of this was produced in the Territory. Forty percent of the taro locally produced was attributed to subsistence farmers and the remaining 13% was commercially produced. The annual report for that same year, which represents the most detailed annual report on agricultural activity in the 20-year period being reviewed, indicates that per capita consumption of taro was 290 pounds.

C. Food Exports

1. Guam

In 1979 total food exports from Guam amounted to $3.4 million, as shown in Table 8. Most of Guam's food exports ($2.3 million) were to the Trust Territory and Commonwealth of the Northern Mariana Islands. In all probability, most of the exports were of commodities originating in the United States and transshipped to final destination countries. Data on transshipments are not available. However, fish and marine products, eggs, and fresh vegetable exports probably were produced in Guam.

TABLE 7

American Samoa Food Imports:
Selected Commodities

	Taro (lbs.)		Banana (lbs.)		Total Food Imports ($ million)
	Marketplace Sales	Imports	Marketplace Sales	Imports	
1960	n.a.	n.a.	n.a.	n.a.	1.00
1964	40,000	--	68,000	--	n.a.
1970	552,000	450,000	552,000	--	3.75
1974	540,000	--	1,250,000	--	11.86
1975	n.a.	n.a.	n.a.	n.a.	9.97
1980	n.a.	n.a.	n.a.	n.a.	14.00

Source: Annual Reports of Governor to the Secretary of Interior.
Economic Development Plan, FY 1979-1984.

2. Trust Territory of the Pacific Islands

Food exports for the TTPI are limited primarily to copra and tuna, which have fluctuated both in price and production over the years. Factors affecting such fluctuations are mainly the world market prices and transportation problems. Because these export products are perishable, transport problems--in terms of cost, availability and reliability--have restricted their growth.

The Marshall Islands lead all others in agricultural exports because of their copra production; Belau leads in the marine sector. Of the $4 million projected agricultural exports for 1980, $3 million will probably be in copra, the remainder being composed of bananas, black pepper, beef, fruits, staple crops and vegetables.

Local military facilities and retail stores in Guam comprise almost the entire export market for the Marianas. Exported commodities are primarily vegetables, beef and milk (Table 9). There has been a decline in export shipments to Guam in recent years.

3. American Samoa

American Samoa appears to have a favorable balance of trade. This is attributed to the substantial volume of canned tuna, pet foods and fish meal that are exported by the local canneries. Other exports are incidental and extremely limited.

TABLE 8

Guam Food Exports: 1979
(in $'000s)

Beef & Veal	1,106
Pork	366
Poultry	249
Other Meats	219
Fish & Marine Products	911
Milk & Dairy Products	240
Eggs	61
Fresh Vegetables	52
Other Fruits & Vegetables	82 82
Other Food Exports	927
TOTAL	3,379

Source: Unpublished trade statistics, Guam Department of Commerce, January 1981.

TABLE 9

CNMI Export Trends[1]
('000 lbs.)

	Vegetables	Fruits	Staples
1973	786	136	68
1974	652	335	77
1975	1,001	20	84
1976	1,424	22	40
1977	1,165 246	20	96
1978	246	2	5
1979	198	3	3

[1]Data for other islands not available.

Source: CNMI, Department of Natural Resources.

III. FARM OPERATORS, PRODUCTION AND DISTRIBUTION

In this section, the characteristics of farmers and farm operations are covered, together with an examination of the commodities produced. In addition to established crop and livestock commodity industries, the status of new and potential industries is discussed. Finally, the agricultural marketing and distribution system is described and assessed.

A. Farmers and Farm Operators

1. Guam

Information about farmers and characteristics of their operations is available from the United States Censuses of Agriculture and from a special field survey which was reported by Karolle and published by the Guam Agricultural Experiment Station.(September 1978 and August 1980). Guam farm characteristics are summarized in Table 10.

The vast majority of Guam farms are small--less than two and a half acres. During the 1960-1978 period, the trend was toward a larger proportion of farms in the smallest size categories. In terms of total number of farms, a low of 1,121 was reached in 1970, and then in the next two censuses, the number increased to 1,576 (1975) and 1,999 (1978).

In 1960, the largest number of farms, 992 (49% of all farms), were located in the central region of Guam, but in terms of the larger size farms (those greater than 5 acres), proportionately more were in the northern and southern areas. By 1978, the distribution of farms among regions had changed substantially from that in 1960. Central Guam experienced a loss of 363 farms, while the northern and southern regions gained 151 and 183 farms, respectively. In terms of the percentage distribution of farms by size within each region, the three regions were nearly the same. However, the 1978 number of "large" (greater than 5 acres) farms was 49, 44, and 66 in the northern, central and southern regions, respectively. With respect to tenure, most of Guam's farmers are full owners. Over 90% of total land area farmed was by owners in 1970 and 1978, compared with over 80% so farmed in 1960.

For the three censuses conducted in the 1970s, the average age of operators

TABLE 10

Guam Farm Characteristics

	1960		1970		1978	
	Farms	Acres	Farms	Acres	Farms	Acres
BY LAND USE:						
Total	2,028	32,108	1,121	26,158	1,999	28,619
Cropland Used for Crops	1,113	3,259	781	2,223	1,493	1,420
Cropland Used for Pasture	478	8,907	134	6,624	460	738
Pasture	1,302	7,462	112	9,478	299	11,168
Other Land	1,212	12,478	1,033	7,830	1,859	15,290
BY SIZE OF FARM:[1]						
2 acres	815		535		1,525	
2-5 acres	549		337		315	
6-10 acres	368		114		67	
11-22 acres	130		56		47	
23-47 acres	86		36		19	
47 acres	80		43		26	
OPERATOR CHARACTERISTICS:[2]						
Age Group: 25 years old			10		20	
25-34			83		221	
35-44			225		423	
45-54			258		725	
55-64			188		414	
65 or over			112		196	
Tenure: Full Owners	1,253		913		1,609	
Part Owners	14		4		31	
Tenants	72		47		116	
Permittees	316		114		93	

[1]Total number of acres not available.

[2]1960 data not available.

Source: Census of Agriculture, various issues.

was 50 (1970). Even though the mean age remained stable, the proportion of total farmers age 45 and over gradually increased from 63.7% in 1970 to 66.8% in 1978. In 1970, 168 farm operators out of 913 (18%) said their main occupation was agricultural, as opposed to nonagricultural. Under the census definition, an operator devoting 50% or more of his or her time to agricultural activities was considered to have agriculture as his or her main occupation. In 1975 and 1978, 266 (17%) and 326 (16%) of farm operators, respectively, reported their main occupations as agricultural. While a relatively small proportion of farm operators in 1978 devoted 50% or more of their time to their farms, these operators controlled 60% of the total land area reported in farms. No similar data for area in farms were available in the 1970 and 1975 censuses.

While over 40% of operators in 1975 and 1978 had been in charge of their farm operations for more than ten years, it appears that a relatively large number began in the late 1960s and early 1970s, and subsequently the number starting operations has dropped off. In terms of place of residence, the data from all three censuses indicate a large majority living on the farm that they operate. In the past, many Guamanians resided in the village or town, and traveled to their ranches or farms which were located at some distance from the village. Practically all farms utilize unpaid labor. In terms of equipment and facilities, relatively few farms had the use of tractors (either owned, rented or borrowed)--228 farms had tractors in 1975, while only 125 had them in 1978. A large majority of farms had both electricity and piped running water. In 1978, 40% of all farms reported having the use of a motor truck, and over 80% had use of an automobile.

2. TTPI

The information on the Commonwealth of the Northern Mariana Islands is taken from the 1979 Census of Agriculture conducted by the U.S. Bureau of the Census. Some of the highlights of the census are that there are slightly fewer farms in 1980 than in 1970, but slightly more land in farms. Thirty-one percent of the farms are 5 to 7 acres and almost half the farms are on Saipan--more than 75 percent of them are privately financed. However, 56 percent of the farms farms produced only for home consumption which is probably a major reason why commercial sales of agricultural products are so low. Table 11 summarizes the characteristics of farmers in the CNMI.

Detailed social and economic characteristics of farmers and farm workers in the rest of the TTPI, as a separate group, are not available. Most of the people living

TABLE 11

Northern Marianas
Farm Characteristics
(1980)

BY LAND USE:	Total	------Cropland----- Used for Crops	Used for Pasture	Pasture	Other Land
Farm Numbers	299	280	146	129	132
Acres	12,187	1,404	1,853	8,688	961

BY SIZE OF FARM:	<1 acre	1-2	3-4	5-7	8-9	10-19	20-39	40-49	50
Farm Numbers	10	46	422	94	8	55	20	4	20
Acres	3	84	161	560	71	711	521	179	9901

BY MUNICIPALITIES:	Northern Marianas	Saipan	Tinian	Rota
Farm Numbers	8	137	77	77
Acres	431	1,684	8,437	1,635

OPERATOR CHARACTERISTICS:	Full Owners	Part Owners	Tenants
Farm Numbers	226	36	37
Acres	1,818	2,116	8,253

Age Group	25 yrs.	25-34	35-44	45-54	55-64	65 & Over
	16	62	49	65	54	23

FARM CHARACTERISTICS:	Home Consumption	--------Sale---------- Crops	Livestock/Poultry	Mixed
Type of Holding	170	53	23	53

Source of Funding	1-24%	25-49%	50-74%	75-99%	100%
Operators	2	2	4	2	256
Private	--	--	3	2	23
Commercial	--	--	--	--	--
Government	1	--	--	--	1
Other	2	--	3	1	3

Source: 1979 Census of Agriculture for the Northern Marianas.

outside the population centers of each state are primarily supported by a combination of copra making for cash income, subsistence agriculture and fishing for their own consumption. The social and economic characteristics of the agricultural population are therefore substantially the same as the total population.

3. American Samoa

There are no known surveys of farms and farm workers which might provide a profile of this aspect of the industry. Table 12 gives some indication of the number of farms, but does not indicate the number of farms that are engaged in the production of more than one of the listed commodities.

As previously suggested, the trend over the past decade appears to have been away from subsistence farming with an increase in the number of commercial farmers. The decline in subsistence farming can be attributed to an increase in work for wages, an increased dependence on prepared and processed foods, and other social and economic phenomena characteristic of a traditional culture that has embraced a modern dollar economy.

Commercial farmers, for the most part, appear to be younger Samoan males, frequently with off-island experience and education, who have access to family land. Most of them have full-time jobs in government or industry and oversee the farming activity as a second job. Farm labor in these commercial operations are primarily family members (aiga) from Western Samoa, who are sponsored by their American Samoan relatives. Farm work, particularly with respect to vegetable crops, is also performed by Korean and Taiwanese fishermen who have jumped ship or married into the local community. It should be added that in the more remote villages on the main island and in the Manua Islands, subsistence farming is still accomplished by more traditional means, whereby certain members of a family are assigned the responsibility of tilling the mountainside patches of taro, banana and other crops.

B. Production

1. Guam

Guam farmers produce a wide range of fruits and vegetables--production figures for 39 types (including varieties of some vegetables) were tabulated by the DOA for FY 1979. Along with fruits and vegetables, other important commodities include eggs, poultry (virtually all chicken), pork, and beef.

TABLE 12

Number of Commercial and Subsistence Farmers:
American Samoa - FY 1972

	Commercial	Subsistence
TRADITIONAL CROPS		
Taro	14	150
Banana	24	200
Others	--	100
SMALL CROPS		
Vegetables	9	39
Fruits	--	80
Flowers	--	12
Others	--	40
LIVESTOCK & POULTRY		
Swine	13	200
Layers	4	1
Broilers	--	--
Cattle	--	3
Others	-- (local chicken)	215
TOTAL	64	1,040

Source: Annual Report of Governor to Department of Interior, 1972.

As noted in the previous section, Guam imports most of the food it consumes. In 1979, local food production represented only about 10% of estimated total civilian consumption. Although local production is comparatively small relative to food imports, production of such items as fruits and vegetables and pork has increased significantly. Egg production continues to be a bright spot in Guam agriculture, with local production large enough to substantially meet local demand.

Principal vegetable and fruit crops produced in Guam are listed in Table 13 for the fiscal years of 1970 and 1977-1979. For each fruit and vegetable, pounds produced and acres harvested are indicated. Total production of any given crop tends to be quite variable, perhaps not surprising given the large number of part-time farmers, the relatively small retail market and the effects of weather conditions on a small production area the size of Guam. In terms of total pounds and consistency,in production, bananas, green beans, cantaloupes and other melons, cucumber, eggplant, bell pepper, sweet potato, taro, tomato, watermelon, and head and Chinese cabbage appear to be the major crops in Guam. Typhoon Pamela in 1976 destroyed many of the fruit trees, but the 1978 and 1979 figures for avocados and papayas indicate that these fruits may become important commodities. With respect to yields per acre harvested, for most crops the 1977-1979 average yield was higher than in the earlier period.

For fiscal year 1975, an attempt was made to categorize crops in terms of their relative potential to supply market demand in Guam (Sohn, July 1977). Based on an analysis of local production, imports, and civilian consumption, the 27 fruits and vegetable species were categorized into four groups: (1) potential cash crops, (2) crops of self-sufficiency, (3) import oriented crops, and (4) other crops. These are listed in Table 14. Group A in Table 14 consists of the eight potential cash crops identified by Sohn; Group B includes the six crops of self-sufficiency; and Group C is comprised of seven other crops which Sohn believes are important enough to be considered for promotion. Import oriented crops identified by Sohn include white potatoes, apples, head cabbage, bulb onions, lettuce, and grapes. These have not been listed in Table 14.

TABLE 13

Production and Area Harvested: Guam

	1970		1977		1978		1979	
	'000 lbs.	Acres	'000 lbs.	Acres	'000 lbs.	Acres	'000 lbs.	Acres
Avocado	10.6	(107)[1]	---	---	37.7	(470)	108.8	(776)
Banana	385.5	80.3	291.7	65.9	189.1	43.0	322.8	54.6
Beans	101.6	22.5	145.6	43.5	258.9	53.3	616.8	79.3
Cabbage, Chinese	---	---	180.0	15.3	36.9	3.2	1,523.9	63.0
Cabbage, head	63.2	24.9	422.0	28.9	67.5	23.5	254.3	40.3
Cantaloupe &		57.3	280.3	29.1	616.0	105.3	720.6	40.8
Melons	123.0	38.8	619.2	43.0	979.2	170.0	126.4	22.0
Cucumber	160.1	27.2	10.2	6.9	11.8	7.7	40.6	13.1
Corn	67.6	24.2	198.0	22.0	206.1	22.9	293.9	29.9
Eggplant	97.1	18.3	---	---	---	---	361.9	72.4
Onions, green	43.2	(575)	---	---	45.9	(850)	138.2	(1420)
Papaya	56.9	27.4	59.4	18.0	15.4	11.6	206.8	22.5
Pepper, bell & hot	54.9	14.3	32.6	3.4	33.6	3.4	.7	.7
Radish	23.1	15.8	63.0	10.4	77.9	12.8	273.8	15.1
Squash	31.7	23.2	216.2	34.1	216.6	41.0	---	---
Sweet Potato	68.9	71.9	55.0	36.3	65.5	43.2	66.7	44.0
Taro	165.1	31.6	144.0	16.1	207.3	22.7	14.4	1.5
Tomato	74.2	64.0	818.0	50.9	3,323.3	207.0	171.5	10.4
Watermelon	191.6							
Poultry	195		118		124		133	
Pork	412		616		1,047		1,110	
Beef	242		75		73		71	
Eggs	2,150		2,108		2,298		2,229	

[1]Figures in parenthesis indicate number of trees harvested and average yield is pound per tree.

Source: Guam Annual Economic Review.
Annual Report FY 1979, Guam Department of Agriculture.

TABLE 14

Production, Importation and Consumption of Selected Guam Fruits and Vegetables: Fiscal Year 1975

Fruit/Vegetable	A Production (pounds)	Percent[1]	B Imports (pounds)	Percent[1]	C Consumption[2] (pounds)
Group A:					
Watermelons	360,814	31	796,803	69	1,157,617
Tomatoes	299,583	36	531,473	64	831,056
Bananas	458,467	63	273,191	37	731,658
Cucumbers	152,389	30	361,779	70	514,168
Eggplants	388,241	92	33,577	8	421,818
Cabbage, Chinese	215,822	56	170,367	44	386,189
Cantaloupes	176,118	46	205,127	54	381,245
Beans	232,854	90	24,654	10	257,508
Group B:					
Bittermelons	157,720	100	0	0	157,720
Mangoes	120,734	80	29,481	20	150,215
Papayas	122,543	97	4,191	3	126,734
Avocadoes	105,920	93	7,677	7	113,597
Corn	92,579	100	0	0	92,579
Squash	83,143	95	4,152	5	87,295
Group C:					
Pepper, bell	93,369	25	275,159	75	368,528
Tangerines	83,404	25	255,288	75	338,692
Onions, green	67,649	22	233,310	78	300,959
Potatoes, sweet	99,024	49	101,346	51	200,370
Radishes	35,094	21	132,136	79	167,230
Taro	96,575	65	52,383	35	148,958
Oranges	49,547	13	319,144	87	368,691
Total	3,491,589	48	3,811,238	52	7,302,827

[1] Percent of Column C.

[2] Column C = Column A + Column B.

Source: Sohn, Hong K., A Public Market Feasibility Study, July 1977.

A 1978 planning report identified cucumbers, watermelons, yard beans, and eggplants as crops that had demonstrated their productive capability in Guam. It recommended that development of additional farm lands be an immediate priority, and that expanded cultivation of specific fruit and vegetable crops, including pineapple, be undertaken (Guerrero, March 1978).

Since 1970, pork production has steadily increased from 412,000 pounds to a high of 1,110,000 pounds in 1979. In value terms, Guam imported $2.53 million worth of pork in 1979 compared with the $0.943 million in sales of local pork by farmers. Thus, local production of pork accounted for 27% of total consumption.

The major constraints to increasing swine production have been identified as lack of USDA approved slaughterhouse, high cost of imported feed, environmental problems relating to land use in the vicinity of urban populations, lack of quality breeding stock, and lack of management and technical expertise necessary to minimize production costs. According to the 1978 agriculture plan, local production potentially could be more than doubled to 2.5 million pounds provided slaughtering facilities were available, and feed costs are held down. (Guerrero, March 1978).

Production of poultry (chicken) has declined somewhat since the decade high of 258,000 pounds achieved in fiscal 1975. In the FY 1976-1979 period, production averaged 124,000 pounds. As previously indicated, total consumption ranged from 2.44 million pounds in 1970 to 2.77 million pounds in 1975, with imports supplying about 91% of this amount.

The low price of imported fryers and broilers compared to the cost of important feed to locally produce the poultry has prevented Guam chicken growers from being competitive. Unless local sources of poultry feed can be developed or the relative costs of imported chicken and feed change, the poultry industry is not expected to expand significantly.

In terms of roasting and stewing chicken, however, an unmet market demand is believed to exist. Since Guam is virtually self-sufficient in egg production, a large number of chickens are maintained by egg producers. The older birds must be disposed of, and it is this source of poultry that could be marketed in larger quantities if a processing plant were in existence (Guerrero, March 1978).

Egg production peaked in fiscal 1975, with 2.5 million dozen eggs being produced. Since 1975, production has ranged from 2.0 to 2.3 million eggs, and this quantity has satisfied practically all of the civilian demand. During 1979, $61,000 worth of eggs were exported to the Trust Territory and Northern Marianas. While this is a rather modest amount, increased exports to this area are feasible.

Beef production has steadily declined since 1970. While total consumption of beef increased from 3.3 million pounds in 1970 to 4.0 million pounds in 1975, local production declined from 0.242 to 0.116 million pounds. During the fiscal 1976-1979 period, local production of beef average 74.5 thousand pounds per annum. In value terms, Guam imported $8.8 million dollars worth of beef in 1979. Although there is a large demand for beef in Guam, expanded local production is believed not to be feasible because of the scarcity of suitable land and the high cost of importing cattle feed.

New industries which have received interest and varying levels of support from private and public sectors include aquaculture, ornamental horticulture, and the production of certain vegetables in hydroponic (controlled environment) operations.

Aquaculture has received the most support, especially in terms of government funding for research, feasibility studies, and experimental and demonstration ponds. Despite research and demonstration support of more than five years, current commercial production is minimal. In 1979, aquaculture production included about 75,000 pounds of eel, 8,500 pounds of shrimp, and 6,200 pounds of fish (tilapia). These products were harvested on about 10 acres of pound area. The Malaysian prawn and freshwater eel are the major species presently being cultured. The eels are being exported to Japan, while the prawns and fish are being sold primarily to the hotels and restaurants. The lack of a Guam hatchery to produce prawn post-larvae, which are now being imported from Hawaii is considered to be the major constraint to increased prawn production. It is reported that two large aquaculture farms are in the planning stage (Guam Department of Commerce, August 1980).

At one time, there were five hydroponic farms in Guam, but Typhoon Pamela apparently was responsible for their going out of business. Hydroponic operations,

although they are capital intensive and require technical expertise, very large volumes of vegetables and plants (such as ornamentals) can be produced in a small area. Currently, the Government of Guam and a private firm are operating a hydroponic operation on a joint venture basis. This operation is primarily for demonstration purposes to determine what kinds of vegetables and fruits could be grown most successfully, and to gain technical and management experience. Both capital requirements and technical know-how are factors which apparently have inhibited private investors from starting new hydroponic farms.

With respect to ornamental horticulture, although it has been recommended as a commercially viable activity, very little government support and private activity have occurred. The University of Guam is reported to be in the process of adding an ornamental horticulture component to its Agricultural Experiment Station research program. Also, several nurseries and other retail outlets are selling locally grown ornamental plants (Guam Department of Agriculture, personal communication, January 1981).

2. TTPI

Other than what is reported in the previous section, data on production, processes, inputs, and costs of farming in the Trust Territory were not accessible. As shown in previous tables, coconut products (copra, coconut oil and copra cake) are the only agricultural commodities of commercial significance. Copra production was firmly established during the German and Japanese administrations and has been the main source of income for the agricultural population ever since. Prior to 1977, all the copra from these areas was gathered in each district center for trans-shipment to Japan or the U.S. for processing. Copra from the Federated States of Micronesia is still handled the same way, while Belau and the Marshall Islands each have a processing plant in operation. The plant in Belau processes the small amount of locally-produced copra combined with imported copra from the Philippines, while the plant in the Marshalls handles local copra only.

3. American Samoa

The decline in agriculture activity in American Samoa, particularly in the last decade, provides a limited base for reporting production on a commodity by commodity basis. Table 15 summarizes the available information.

The traditional staples that comprise a significant part of the Samoan diet are in descending order: (1) taro, (2) green banana, (3) breadfruit. With the

TABLE 15

Plantings and Acreage: American Samoa

	1970 Acreage	1971		1972	
		Number of Plants	Acreage	Number of Plants	Acreage
Taro	680	2,667,270	444	816,780	340
Banana	140	300,000	400	3,681	186
Ta'amu	12	195,280	39	29,710	80
Coconut	75	9,350	75	990	20
Yam	1	6,730[1]	6	760[1]	2
Sugarcane	1	8,730	4	2,720	3
Kava	0	1,320	2	800	2
Cassava	2	13,780	3	4,180	6
Sweet Potato	0	105[1]	1	105[1]	1
Vegetables	20	n.a.	9	n.a.	18
Breadfruit	n.a.	1,590	n.a.	345	n.a.
Pineapple	n.a.	2,970	n.a.	800	n.a.

[1]Number of heaps.
[2]Number of acres.

Source: Annual Report of Governor to Department of Interior, 1972.

decline in subsistence farming, there has been an increase in the number of commercial plots. It is estimated that there are from 300 to 400 acres currently planted in taro. Of this total, as much as 200 acres are estimated to be in commercial farms of ten to fifteen acres in size. The balance consists of subsistence crops which follow traditional planting methods. The commercial farms, for the most part, are located in the western district. In addition, certain traditional leaders on Ta'u in the Manua group, with the initial assistance from OEO, are growing taro for export to the west coast United States. This project, which began in 1976, initially exported 16,000 pounds of taro. The present status of this project is not known. However, at one stage, the demand expanded beyond production and orders were being filled by importing taro from Western Samoa for subsequent trans-shipment.

Bananas are perhaps on a par with taro as a preferred staple in the Samoan diet. However, bananas are more subject to storm damage, diseases such as bunchy top, and a slightly longer growing period, and thus are not as reliable as taro. It is estimated that between 150 and 200 acres, based on recorded levels in 1974, are planted in bananas today. The majority of this production would be subsistence farms.

Citrus crops have never been grown on a commercial basis. There are a limited number of lime, orange and grapefruit trees that were introduced during early periods of trade, which provide households a modest supply of fresh fruit. Import statistics show that an increasing volume of fruit, particularly apples and oranges from both the United States and New Zealand, is being consumed.

The large Taiwanese and Korean fishing fleets, which supply the canneries and are provisioned at Pago Pago, are supplied in part with locally grown vegetables. These farms, though locally owned, are usually farmed by oriental males who have jumped ship or have obtained residency status through marriage. Total acreage that is planted in vegetables was reported at approximately 20 acres in 1972, with nine commercial and 39 subsistence producers. Today's production level would not greatly exceed that of 1972.

Though dairy and beef cattle are raised in American Samoa, the restrictions imposed by limited pasture land, absence of feed crops, and the expense of importing such feeds have placed sufficient disincentives on raising livestock to hold it to a subsistence level. There are only a few herds of modest size in all of the Territory.

Hogs are the principal source of locally produced meat. There are a few

commercial producers on the island of Tutuila. Locally grown hogs are not slaughtered for butchering and sale by the producer, but are as a rule sold on hoof for use by families at ceremonial occasions such as weddings and birthdays. On such occasions, they are individually slaughtered and cooked in the traditional oven. The restaurants and hotels have traditional "fiafia" nights where roast pig is commonly served. Such demand is apparently supplied through local production.

Production of poultry has been dominated by the government up until the year 1975. There are now an estimated five commercial producers of eggs. Subsistence producers were numbered at 215 in 1972. This figure has, in view of the evidence of a general decrease in subsistence farming, undoubtedly decreased.

Fresh egg production is generally used to supply the local restaurants and the hotel, with some sales in the marketplace. The majority of eggs and poultry consumed, as indicated by a comparison of reported production and imports, is supplied by various non-local sources.

C. Marketing and Distribution

1. Guam

Marketing and distribution has been identified as one of the most serious problem areas constraining agriculture in Guam, especially with respect to field and orchard crops. Some 48 varieties of fruits and vegetables were consumed by the civilian population in 1975, but while total demand is substantial, the market conditions for locally produced individual crops are often erratic, with prices fluctuating sharply with changes in supply.

Institutional components of the distribution system in Guam include four farm cooperative associations, military base commissaries and messes, about 10 major retail chain stores, hotels and restaurants, a public market, merchant middlemen, and other wholesalers and retailers. This system has been characterized as disorderly and erratic in the sense that very little is done to provide a reliable supply, to plan plantings and deliveries to avoid market gluts, to rationalize distribution channels through contractual commitment or formal marketing arrangements, and to grade, package, price and promote commodities for maximum appeal to the ultimate consumers (Fairbain, 1977; Sohn, 1977; and Guerrero, March 1978).

Given the large number of small farmers, wide range of commodities consumed, and relatively small population of Guam (small in the sense that relatively little

land is needed to produce the total demand for a given commodity), circumstances would seem to favor a strong role for cooperatives. However, according to estimates for 1976, only about 21% of farm production went directly to the cooperatives. The largest share of output (34%) went directly from farmers to civilian retailers or wholesalers, 18% went to middlemen other than wholesalers, 2% went to the military, 9% went to hotels, restaurants, and school cafeterias, and 16% went directly to households (Sohn, 1977; distribution based on data from the Guam Farmers' Cooperative Association).

There are three farm cooperative associations in Guam that serve field and tree crop farmers: The Guam Farmers Cooperative Association (125 members), Guam Farmers Union Association (16 members), and the Malojloj Green Farm Association (21 members). It was reported that 60% to 80% of the members regularly depended on the co-op marketing system, but that some members either bypassed or attempted to bypass the co-op by selling directly to customers. Those farmers unable to find customers then brought their produce back to the co-op. However, lack of storage facilities was a large problem, necessitating the distribution of farmer's produce on the same day that it entered the co-op.

Efforts made since 1978 indicate at least some progress in some of the above problem areas:

A crop forecasting and market news program has been reactivated. This program entails the bi-weekly release of information to farmers on the acreages of specific crops that have been or are scheduled to be planted and harvested. A summary of current market supply and demand conditions and prices of selected commodities is a part of this bi-weekly service (Guerrero, March 1978; and personal communication from the Department of Agriculture, January 1981).

To help facilitate a more reliable supply of farm produce, the Government of Guam established an Agricultural Marketing Facility governed by a Marketing Board. The membership of the Board includes the directors of the Departments of Agriculture and Commerce; Dean of the College of Agriculture and Life Sciences (University of Guam); Guam Farmers Cooperative Association;

Guam Farmers Union Association; Malojloj Green Farm Union Association; Guam Hog Producers Association; and the Guam Fisherman's Cooperative Association. Purpose of the marketing facility is to collect and evaluate all marketing information to permit more organized production among farmers in meeting local demand (Department of Commerce, June 1980).

2. TTPI

Distribution services and facilities, as in most infrastructural requirements, are rudimentary throughout the Trust Territory. There are several farming cooperatives--two on Saipan and one each on Tinian and Rota. They provide purchasing and marketing services, but it is not known how many farmers actively use the cooperatives.

Micronesia produces a very small fraction of world copra and coconut oil production and is subject to all the vagaries of the world market for coconut products. Each political entity in Micronesia has a Copra Stabilization Board to lessen the impact of the extreme fluctuations of the world prices of coconut products on producers. Each state's production is marketed by its Board in an attempt to get the best price available.

Distribution systems for other agricultural commodities are informal and generally undeveloped. Almost all other agricultural production is for domestic consumption only.

3. American Samoa

Typical of most islands with historically agrarian economies, American Samoa has long had a town center which serves as a marketing hub for locally produced crops. The center in American Samoa is at Pago Pago, and though it continues to be a bustling hub of trade on weekends, much of the produce sold is brought in from outside islands.

For locally grown produce, distribution is almost always direct from producer to consumer. This includes both produce that is sold in the marketplace by local producers and that which is sold to the fishing fleets. Imported produce is handled by retail establishments or by local entrepreneurs with family ties in Western Samoa or Tonga. The latter group of importers sell their produce in the open market place or at times direct

from trucks which visit major villages.

There are eight principal retail outlets in the Territory which have substantial refrigerated storage capacity necessary for the sale of most produce (the government-owned open market place does not have refrigerated facilities). There is, as yet, no centralized refrigerated distribution center.

IV. AGRICULTURAL RESOURCES, INFRASTRUCTURE AND SUPPORT PROGRAMS

In this section, factors of production essential to agriculture are covered; these include such resources as land, soils, capital, labor, and water. Physical infrastructure including irrigation systems, food processing facilities, storage, farm roads, and marketing support facilities are discussed. Also addressed are the government programs which directly support the agricultural sector--research and extension, marketing assistance, leased land, capital loans, crop insurance and other programs.

A. Land

1. Guam

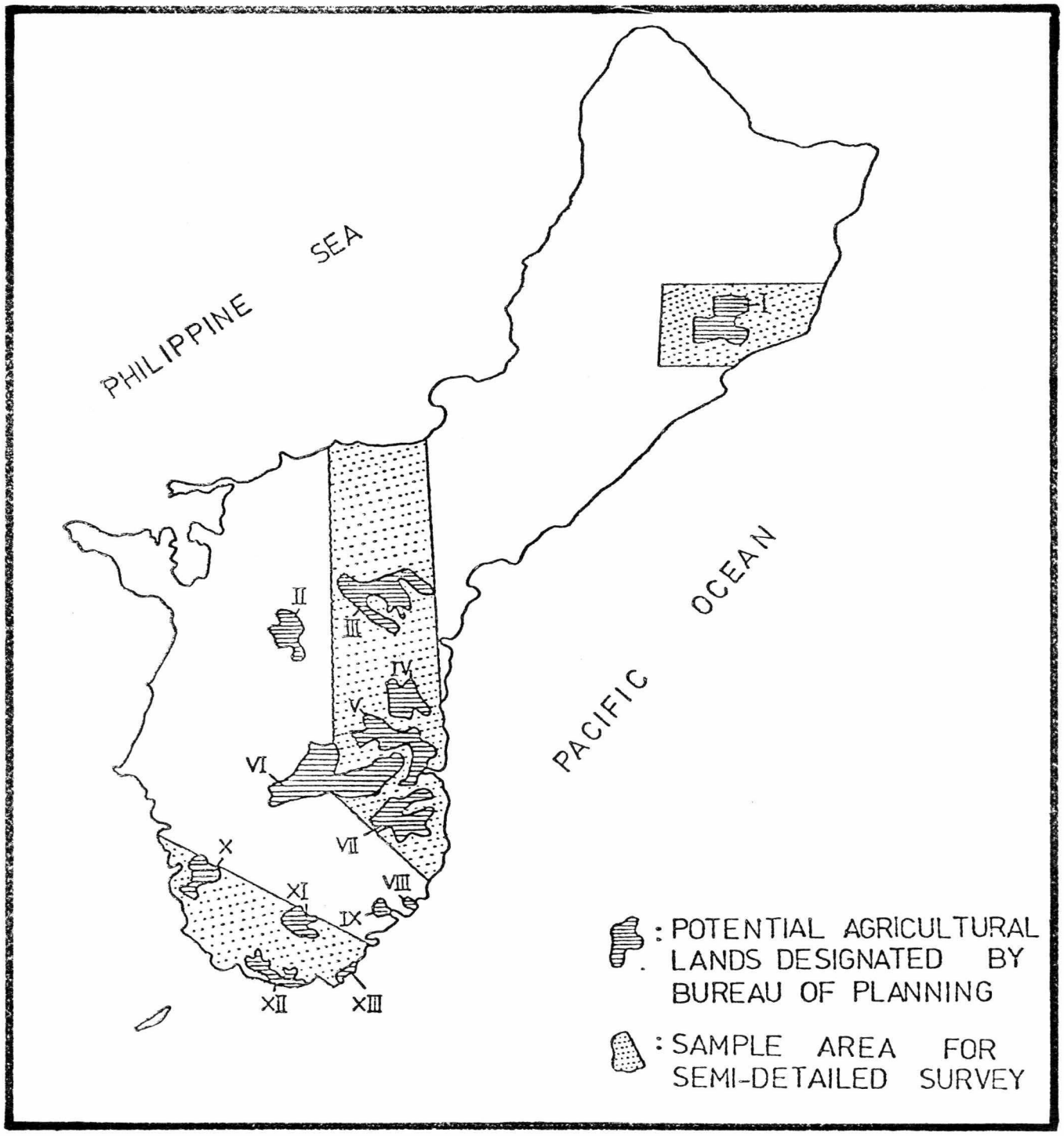
As previously noted, total land area in Guam is about 212 sq. miles, or about 135,680 acres. The Federal Government owns about 44,511 acres (32.8% of total), the Government of Guam owns about 25,000 acres (18.4%), and the balance of 66,169 acres (48.8%) is privately owned.

Of primary concern here is the land that is available and usable or potentially usable for agriculture. In 1977, the Guam Bureau of Planning designated 4,015 hectares (9,920 acres) as potentially "prime agricultural land", pending completion of a comprehensive soil survey, which is described in the next section. These lands are indicated in Figure 4.

Comparison of land actually in agricultural use against that designated as potentially usable provides a measure of capacity for expansion. An indication of the amount of land actually used for crops is given in the Agricultural Development Plan, which reported that an estimated 300 acres of land, cropped two to three times a year, are used to produce the fruits and vegetables grown in Guam (Guerrero, March 1978). A more comprehensive figure is given by Karolle who estimates that 1,700 acres (688 hectares) are being farmed by 256 farmers to produce field and orchard crops, as well as livestock (1978). Thus, the 4,015 hectares of land designated for agriculture by the Bureau of Planning represents a large potential capacity for expansion. Further, in terms of land area required to attain self-sufficiency in local consumption of the eleven cash crops identified by Sohn, it has been calculated that only about one-fifth of the potential expan-

FIGURE 4

Location of Potential Agricultural Lands



Source: Park, M.E., Soil Survey of Guam, 1978.

sion capacity (803 hectares) would be required.

It should be noted that the planned agricultural growth is expected to occur in the southern region of Guam. Urban growth, environmental concerns about maintaining the aquifer, and military control of large areas, are all factors which would probably preclude significant expansion of agricultural land use in the northern region.

To stimulate agricultural development in southern Guam, the Government of Guam has taken the first steps in developing an 891 acre agricultural industrial park. The College of Agriculture and Life Sciences and the Guam Economic Development Authority are in the process of securing funding for a 1.3 mile access road to the 50 acre site of the new Ija Agricultural Experiment Station. This access road in the Inarajan District will open up a large area of potential agricultural land which is presently inaccessible. The 50 acre site in the park is also to accommodate a planned food processing facility and other agricultural support activities. The USDA has committed funds to assist in the further development of the experiment station site (Department of Commerce, June 1980).

Although data on agricultural land prices and rents for leased land is not available, it is believed that, similar to Hawaii, land costs are high relative to the typical returns that can be earned in the various commodities produced by Guam farmers. Government of Guam has land lease programs for agricultural lands, which are discussed below.

The first comprehensive soil survey of Guam was completed in 1978. An earlier reconnaissance soil survey was done by a military geology team in 1954. The main purpose of the recent survey was to derive full information on the soil characteristics of the potential agricultural lands designated by the Bureau of Planning in 1977 as a basis for future land use and management policy. The "prime" agricultural lands designation was to await completion of the survey. Accordingly, the soil survey classified kinds of soils and terrains, mapped soil locations, specified current land uses, and suggested potential uses in line with appropriate land management techniques (Park, 1978).

In Table 16 the potential agricultural areas of Figure 4 are listed and the acreages are indicated by suitability class and according to traditional and modern farming system. The data in Table 16 indicate that there are 5,168 acres (2,091 hectares) of very to moderately suitable land (traditional farming systems) in Guam in the potential agricultural lands designated by the Bureau of

TABLE 16

Approximate Number of Acres of Potential Agricultural Land by Suitability Class and Farming System in Relation to the Total Land Area of Guam

Suitability Class[1]		Land-Use Recommendation	Farming System	Total Acres In Guam	Potential Agricultural Land[2]	
					Acres	Percentage of Total
Reclaimable Land	Class 1	Arable land	Traditional	4,332	1,425	32.9
			Modern	14,843	4,653	31.3
	Class 2	Arable land or pasture (intensive)	Traditional	12,619	3,743	29.7
			Modern	18,176	2,243	12.3
	Class 3	Pasture or forest (extensive)	Traditional	73,098	4,012	5.5
			Modern	63,599	2,284	3.6
	Total acres of reclaimable land		Traditional	90,049	9,180	10.2
			Modern	96,618	9,180	9.5
	Class 4	Forest or recreation sites	Traditional	45,631	136	0.3
			Modern	39,062	136	0.3
	Total acres			135,680	9,316	6.9

[1] Suitability Classes= 1: very suitable land
2: moderately suitable land
3: slightly suitable land
4: non-suitable land

[2] As designated by the Guam Bureau of Planning.

Source: M. E. Park, Soil Survey of Guam, 1978.

Planning. If modern farming systems are used, then 6,896 acres (2,791 hectares) would be considered very to moderately suitable for agricultural use.

What is not clear is the extent to which the potential agricultural lands (Figure 4) are presently being used for crop or livestock farming, and how much land is available for expanding agriculture. Based on the location of farms identified by Karolle, it seems evident that many existing farms are outside the potential agricultural lands designated by the Bureau of Planning, while some existing farms are within the potential agricultural lands. The Agricultural Development Plan noted that there were 5,151 acres of arable land available in southern Guam in the districts of Yona, Talofofo, Inarajan, Merizo, and Umatac (Bureau of Planning, March 1978). If these lands fall within the designated agricultural districts and also are very to moderately suitable in terms of soils, then it would appear that there is ample land for expanding agriculture.

The soil survey also confirmed that Guam soils have limitations in terms of their productivity for agricultural use and that proper soil management practices are necessary to achieve high crop yields. Guam soils are, for the most part, eroded, badly lacking plant nutrients, and are low in natural fertility. Such limitations as wetness, lack of water, erosion, and chemical and physical deficiencies must be compensated for or removed to obtain high agricultural productivity.

2. TTPI

The 1974 Annual Report to the United Nations gives estimates of land resources in the Trust Teritory islands, but its accuracy is doubtful. Aside from land tenure constraints, other factors related to land in the TTPI constrain commercial agricultural activity.

Many islands are so small and barren that they are not inhabited; there are few "high" volcanic islands which are better suited to agriculture. Also, on some islands, especially Saipan and Tinian, the presence of live munitions leftover from World War II makes farming hazardous.

Aside from the limited amounts of privately owned land, two institutional factors may also present a constraint to the development of agriculture. First, ownership of land is limited to persons of Micronesian descent. This mechanism is intended to ensure local control over land resources, but at the same time limits the market for land transactions and possibly hinders the best economic use of the land. The leasing of land is allowed, but is not an extensive practice because of the limited supply.

Second, the optional use of some lands, especially on Tinian, by the U.S. Department of Defense could restrict further growth of agriculture, especially since Tinian is the major agriculture-producing island in the Commonwealth.

The U.S. Soil Conservation Service recently completed soil surveys for all major islands of the TTPI, except the Northern Marianas. Issuance of these findings should provide a more factual basis for evaluating the physical potential for agriculture.

At present, the CNMI, especially Tinian, are believed to have the best soils; however, absence of a current soil survey hampers efforts to determine what soils are present and how much improvement can be obtained with irrigation and fertilizer. The last complete soil survey was done by the U.S. military after World War II and needs to be updated.

3. American Samoa

The total number of cultivated acres in American Samoa, which has been estimated in past reports as being as high as 12,000 acres (1968), includes such tree crops as coconut and breadfruit. Subsequent estimates indicate that 75% of the total land in agriculture use was in coconut and breadfruit.

In 1950, the U.S. Census of American Samoa reported 14,830 acres were in farms with an average farm size of 10 acres. In 1960, total acres were 11,230 and average farm size was almost one half the size in the previous census, or 5.2 acres. A 1968 survey by an agriculture team from New Zealand estimated that 28% of all land in the Territory could be cultivated (13,440 acres). The same report said that of this total, 40% was not fully utilized.

The apparent inconsistency in the census data is attributable to a change in definition of what constitutes farm activity rather than a sudden increase in the number of farms. The reported decrease in total acres farmed and the 1968 survey, however, may be an accurate indicators of the decline in the agriculture industry for the ten year period, 1960 to 1970.

The soils of American Samoa are primarily latosolic and basaltic origin. The Tafuna-Leone plains on the major island of Tutuila has the greatest expanse of land under 10% slope. One may see evidence of geologically recent lava flows (there are no active volcanoes in American Samoa) along the shoreline. The remainder of the plains are covered with a thick tropical growth, which would

seem to suggest the soil would be rich with nutrients which contribute to the support of most agricultural crops. However, much of this area is underlaid with immediate or near surface lava flows and outcroppings of basalt, which would be detrimental to extensive cultivation of the plains.

There are areas in the western portion of the plains which consist of silty and sandy clay loans. Some of these lands are presently used effectively for production of taro, bananas and vegetables. There are several upland plateaus, more noteably the one at Aloau Fou, which consist of silty clay soils and are being used for commercial taro production.

A general soils survey was made in American Samoa in 1952. A more detailed soils mapping effort is currently being conducted through the Coastal Zone Management Program.

B. Capital

All the territories under study in this report consider the availability of capital for agricultural purposes to be a major problem. The government-owned banks or government-funded programs appear to be the primary sources of capital. The small size and high-risk nature of farming have discouraged private lenders from making agricultural loans.

1. Guam

Three regular government loan programs are in effect. The Farmer's Small Loan Revolving Fund is administered by the DOA. The total resources available under this program amounted to $250,000. The maximum loan under the fund is $10,000 at an interest rate of 2%. However, because of poor loan repayment experience and a very large demand for new loans, the funds available are extremely limited (DOA, Fiscal Year 1980 Annual Report).

The Guam Economic Development Authority (GEDA) administers both an Agricultural Development Fund, and the more general Guam Development Fund, which earmarks 15% of its loanable funds for agricultural purposes. The Agricultural Development Fund was initially funded at $100,000 and has made loans to eligible farmers at an interest rate of 3%. The Guam Development Fund was federally funded with total resources amounting to $5.0 million. The 15% ($750,000) allocated to agriculture is loanable at a 9.375% rate. Government loan funds available to agriculture are insufficient in total amount, and individual loans are not available in large enough sums to support commercial operations.

2. TTPI

Many farms are financed by the operators, themselves. Government funding, through the Economic Development Loan Fund or the Small Business Administration, is available for agricultural businesses. Other credit sources are available, but difficult to qualify for.

3. American Samoa

The government owned development bank assists the local farmers' cooperative in the bulk purchases of feeds, fertilizers, and other farm supplies. The development bank has also provided direct assistance to a taro-for-export project in the Manua islands as well as to other commercial taro growers. The bank is frequently asked to guarantee loans in ventures that are viewed as risky by the commercial bank--this includes agricultural loans.

Interest ceilings are established by the Fono (legislature) usually in response to world trends and pressure from the local lending institutions. These ceilings do not apply to commercial loans; however, they do constrain mortgage funds for farming and related activities since they usually lag behind world trends.

C. Labor

There is a shortage of agricultural labor throughout the three territories. This is due mainly to the low esteem held for farm work; low wages and benefits in farming compared to other emplying sectors; and low profitability which keeps farmers from expanding. Past labor shortages have been alleviated by alien laborers, but increasingly, government policy is discouraging this practice.

1. Guam

Available data clearly indicate that paid employment in agriculture is very small, numbering about 100 workers at most. The 1978 Census of Agriculture findings indicated that 20 farm operators hired 86 workers during 1977. In contrast, the 1,981 operators who responded to the census questionnaire, said they had 3,882 unpaid workers on their farms. Thus, most farmers rely on family help in farming their land.

Given the current level of technology, infrastructure, and marketing conditions which prevail, labor productivity and the profitability of farming is low in comparison with commercial farming in Hawaii and in other developed areas. The small number of farm operators in Guam whose production is mainly for sale, and the small proportion of total consumption produced locally appear to confirm this assessment.

An increase in the profitability of farming in Guam, now dominated by family owned and operated farms, could be expected to increase the demand for agricultural workers so that higher wages and improved benefits and working conditions would have to be offered. However, if government employment continues to expand and pay rates remain significantly higher than offered in private employment, then there will be relatively little interest on the part of job seekers to consider careers in farming or other private agriculture related jobs.

2. TTPI

Although the private sector, which includes the tourist industry, has expanded and increased wages levels, the jobs are still not as well-paying or prestigious as government jobs. Agriculture, as part of the private sector, faces even more difficulties in attracting labor; the general view of this occupation is that it is a lowly vocation which doesn't pay much, and children do not receive much encouragement to go into the field. Increasing wages in sectors such as tourism and government make it hard for agriculture to compete for labor--especially since higher wages increase production costs and make it difficult to compete with imports from other countries.

3. American Samoa

Reference has already been made to the lack of interest among the American Samoan labor force in agricultural endeavors. This has led to the employment of former fishing fleet crew members on truck farms. Western Samoans and Tongans provide agricultural labor in farm activities that produce more traditional crops.

Formal sponsorship of this primarily alien farm labor force, through the granting of visas, is not always easily obtained. Government policy, as expressed through the Territorial Immigration Board, has wavered from a liberal to stringent posture. It would appear, however, that until such time as interest in farming activity can be rekindled among the American Samoans, it will be necessary to rely on the neighboring island groups for agricultural manpower and to admit them on a controlled and sanctioned basis. Certainly, any agricultural development effort which is labor intensive will need this available, neighboring and relatively inexpensive source of labor.

D. Education and Extension Service

1. Guam

In January 1973, the University of Guam became a member of the United States Land Grant University System. As a land grant institution, the University is a recipient of federal funds for agricultural research and extension. During 1973 and 1974, the Guam Cooperative Extension Service (a joint program including the USDA) and Agricultural Experiment Station programs were established.

With land grant instructional program funding and territorial higher education funding, the College of Agriculture and Life Sciences (CALS) was established to offer degrees in agriculture and home economics. Many of the researchers appointed to the agricultural experiment station also teach or do research within CALS. The University of Guam has a Marine Laboratory which conducts research in aquaculture, as well as in wild stock fisheries and other marine related subject areas.

Besides the University of Guam, the Guam Community College (established in 1978) is reported to be developing an agricultural curriculum. Apparently, the community college has assumed the vocational and career education functions of the Department of Education, along with programs from other Government of Guam agencies.

The Cooperative Extension Service, a part of CALS, offers a program of services to farmers and the general community emphasizing the following areas:

(1) Efficiency in agricultural production, management and conservation of natural resources.

(2) Efficiency in marketing, distribution, and utilization of agricultural products.

(3) Improvement of family living, nutrition, health and consumer satisfaction.

(4) Assistance with community improvement, resource development and public affairs information.

(5) 4-H and youth development programs.

A bi-weekly newsletter, CALS Caller, is published and distributed to the general community by the Cooperative Extension Service (CES). Agricultural, as well as health and other subject items are communicated to the public. In conjunction with the Guam Department of Agriculture, CES also publishes the

the Crop Forecast and Market News.

2. TTPI

It has been noted that there is a general lack of agricultural vocational training in the school system, but efforts are being made to change this situation; the Northern Marianas vocational program now begins in the 8th grade and continues through the 12th grade. The Ponape Agricultural and Trade School (PATS) is a four-year vocational high school which offers courses in agriculture, mechanics, and construction. In 1975, it had an enrollment of 171 students from the six district/states of the Trust Territory. A 1980 amendment to the Higher Education Act of 1965 (P.L. 96-374) accords land grant status to the Community College of American Samoa and the College of Micronesia (Ponape), but its recent occurrence makes any impact on agricultural education in the islands highly unlikely.

The Micronesian Agricultural Teacher's Association (1973) has identified several problem areas in agriculture education:

1. There is not enough land to maintain a successful agriculture school program.
2. There are not enough teachers or facilities.
3. The emphasis of school curriculum is on life sciences--biology, physical sciences, etc.
4. Agricultural courses are not compulsory.
5. There is a problem with stealing produce from experimental gardens.

In general, agriculture expenditures have been small compared to other government activities. The public education systems have stressed college preparation and clerical skills and have almost completely neglected vocational training of all types, including agriculture.

The extension service in Micronesia was started twenty years ago. Today there is a Chief of Extension Service and extension supervisors in each district state, who is responsible for the supervision and guidance of field agents. However, field agents are often responsible for large areas and therefore can often provide only limited on-farm advice.

The Northern Marianas Agricultural Division has a main office, and Kagman and As Perdido Experiment Stations on Saipan, as well as substations

on Tinian and Rota. The Kagman Plant Industry Station performs research and makes recommendations to farmers on the best suited crops and proper usage of fertilizers and pesticides. The Plant Protection Program is responsible for the control of disease, pests, and insects currently affecting the industry and the prevention of the introduction of new diseases and pests. The Division of Animal Health and Animal Industry is responsible for a variety of veterinary services through its Veterinary Clinic. They are also responsible for meat and cattle inspections, rental of cattle trailers and breeding stocks, as well as the operation of the government slaughterhouse.

A review of various reports by visiting United Nations Task Forces, annual reports, and a USDA Survey indicate the main problem of the extension service in the TTPI is the inadequate staffing and training of extension personnel. There are not enough staff members who come in direct contact with the farmers and their problems, since much of the emphasis of the extension service has been on research and administrative duties. Also, much of the training received by extension personnel is often unrelated to the conditions and needs of the local farmers; and some are placed in administrative positions without adequate experience or training. In general, inadequate planning and funding of agricultural development programs have hampered improvements in the quality of extension service.

3. American Samoa

The drought of 1975 and the local revenue shortfall that followed resulted in the closing of the demonstration farm at Taputimu and the termination of all extension services, including sales of farm supplies and feed. Thereafter, the entire Department of Agriculture was placed under the supervision of the president of the Territorial Community College, presumably to take advantage of its newly bestowed land-grant status.

Extension services had been provided in areas related to trials at the government farm, including poultry production, animal husbandry, vegetable crops, and the more traditional crops of banana and taro. There have also been research activities in insect control--particularly the rhinoceros beetle--fertilizers, and livestock feeds.

While the Department of Agriculture once provided assistance of a more direct nature to the Samoan farmers--notably the rental of equipment, breeder stock for swine, seeds, fertilizer and feeds at cost--there is little or no assistance of this form provided today. There is one cooperative, which was organized following the government's cessation of extension services, that continues to serve a small group of farmers. This coop is assisted by the Government DevelopmentBank with short-term funds and administrative guidance.

Though once an active part of the public high school vocational training program, formal agriculture training activity is now quite limited. Some courses are offered in the high school and at the community college.

E. Research and Technology Projects

1. Guam

Agricultural research and development is presently sponsored or carried out primarily by the Guam Department of Commerce, Guam Department of Agriculture, University of Guam, and the Guam Economic Development Authority. The first and last mentioned agencies typically contract with consulting firms or with the University of Guam for the actual research or development work. Within the University of Guam, CALS and the Marine Laboratory (with respect to aquaculture) are the units which normally perform most of the research and development.

Project description of work underway indicates that the Guam Experiment Station is conducting much of the research within CALS. The program was initiated in 1974, and thus is still relatively new in terms of the scope of research and time typically necessary to begin realizing results.

The experiment station concentrated its earlier efforts primarily in three areas: horticulture, soils, and entomology. In horticulture, efforts have been concentrated in identifying the best varieties of each crop suitable for growth, under environmental conditions in Guam. Thus far, Chinese cabbage, eggplant, bell pepper, head cabbage, and tomato varieties have been screened. With respect to tomatoes, research has been done in cooperation with the Asian Vegetable Research and Development Center, which supplied ten breeding lines of new cultivars.

In 1975, the experiment station established a soil testing laboratory. Since little work had been done on assessing the fertility of Guam soils, an extensive program of soil testing and mapping was initiated. In 1978, a soil study was completed using the United States Soil Taxonomy method. Also, a nitrogen study was conducted in association with the INPUTS (increasing production under tight supply) project of the East-West Center in Honolulu.

In regard to entomology, emphasis has been on integrated control methods utilizing biological control, sampling techniques, proper use of insecticides, resistant varieties, and cytogenetic studies. Effective control measures have been investigated for diamondback moth on cabbage, banana aphids, coconut asiatic corn borer, bagworm (on ornamentals), a mealybugs on tangantangan and poincianan looper (on flame tree).

Research programs in fruit horticulture, plant pathology, animal science, agricultural engineering, aquaculture, agricultural economics, and land use studies are relatively new programs that have been added to the overall work of the Guam Experiment Station. Many of these programs entail joint research efforts with the faculty of CALS, and with personnel of the Cooperative Extension Service. A second experiment station side at Inarajan, in southern Guam, is being developed, and professional and technical staff have gradually increased since 1974 (CALS, University of Guam, various issues of Experiment Station Annual Reports, 1976-1979). The 1979 Annual Report of the Guam Agricultural Experiment Station listed nine researchers, several of which were on joint appointments with CALS, other faculty positions with the University, or were with the Marine Laboratory.

The Guam Department of Agriculture (DOA) is responsible for developing and protecting the island's agriculture, natural resources, and aquatic and wildlife resources. In FY 1980, the department had a staff of 76, of which 13 were federally funded--mainly in the aquatic and wildlife resources area. Most of the department's staff is involved in providing support services to agriculture, and in regulatory and protection programs. With respect to research and development, the department is active in developing fruit and vegetable species suitable for Guam, and in devising insect and disease control eradication programs. Banana bunchy top disease control and eradication has been an area of recent concentration. Also,

in aquaculture, developmental work is underway on culturing a number of species, and a demonstration project at an aquaculture farm in Merizo dealing with freshwater prawns is a current activity. The department is also carrying out research in the areas of wildlife and fisheries.

In the area of applied research and development, the Guam Department of Commerce and the Guam Economic Development Authority (GEDA), have sponsored a number of studies relating to agricultural infrastructure, marketing, and aquaculture. To recapitulate, these studies include: a public market feasibility study, the feasibility of a fumigation and food processing plant, a swine slaughterhouse feasibility study, a soils analysis and mapping study, a demonstration hydroponic project in joint venture with a private firm, a prawn hatchery study, and development planning for an agricultural park at Ija, which is now underway. As indicated, most of the studies deal with the commercial feasibility of the proposed projects.

2. TTPI

Agricultural research projects have sought to identify priority crops. As mentioned, the Kagman Agriculture Experiment Station conducts research on varieties, fertilizers, pesticides and herbicides to make recommendations to farmers. It also conducts demonstration farms on the proper use of chemical fertilizers, insecticides, etc. as well as on production techniques.

In addition to the small amount of research conducted by each government's department of agriculture, the Republic of China (Taiwan) is jointly sponsoring an agricultural demonstration project with the Government of the Marshall Islands in Laura Village on Majuro Atoll. The project is concentrating on vegetable production for local consumption and has conducted at least one month-long training program for twenty people from the outer islands of the Marshalls.

3. American Samoa

American Samoa, as a participant in the South Pacific Commission, benefits from the Agricultural Research Program of the Commission. Research projects are identified and selected at an annual conference held by Commission participants. Though research projects are not always applicable to the Territory, project write-ups are shared with all Commission

members.

On the other hand, the Territory's U.S. affiliation has enabled conduct of more site-specific research. Research on the rhinocerous beetle has been carried on for many years by the Department of Agriculture. There have been numerous trials with a broad variety of vegetable crops. Various strains of beef cattle, hogs and poultry have been introduced and bred to improve the local strain.

Generally speaking, it appears that a fairly broad range of research has been conducted over the past 15 years, up to the year 1975. Most of the work was conducted at or through the government Department of Agriculture's experimental farm at Taputium. While this activity has been discontinued, results of this research are available for review.

There is apparently little research being conducted in the Territory at present other than that associated with the Community College's course work. The Territory may benefit, even participate in, some current research being conducted with the use of taro tops as livestock silage in Western Samoa by Dr. Jaw-Kai Wang of the University of Hawaii, under the Section 406 Food for Peace Act.

F. Conservation Programs

Guam and the Commonwealth of the Northern Marianas have no official conservation programs currently in effect. However, the CNMI is expected to open an office of Wildlife Conservation, subject to availability of material and personnel funds.

American Samoa and the rest of the Trust Territory are involved in U.S. Environmental Protection Agency programs. The Trust Territory program is focused primarily on protection of marine reef environments; little attention is given to soil conservation and environmental protection in agriculture.

In American Samoa, the Environmental Protection Agency programs have been in force since 1976. More recently, the Territory has developed and initiated a Coastal Zone Management program which applies not only

to coastal regions such as the Bay area, but to all lands of the Territory. The importance of this new program lies in emphasis given to integrating or networking of all development and land use activity under one umbrella organization. Under the implementing measures currently being reviewed by the governor, the Territorial Department of Planning and Economic Development will act as the clearinghouse for all proposed activity of substantial land use or developmental nature.

Soil conservation, per se, has not been of major concern to the Territory's development program in the past. This may be due in part to the absence of a comprehensive soil survey or even government control of a program which centered on development of infrastructure. Implementation of the CZM program in particular, should it be given the teeth prescribed in the implementing document, should discourage environmentally detrimental practices.

G. Government Support Programs

Guam appears to have the best developed government support programs. The following support services available to Guam farmers have been identified: government leased land, subsidized water rate, crop forecast and market news, plowing and land clearing, sale of purebred animals and stud service, veterinary services, farm loans, crop insurance, insect and disease protection and eradication, sale of vegetable and fruit seedlings, management assistance to cooperatives, applied research, extension, pilot or demonstration projects, farmers' market, market revolving fund, and the Agricultural Marketing Facility. The TTPI has some veterinary services available and it did have an equipment lending programs until recently. The CNMI is considering implementing a food stamp program. Except for disaster relief and a livestock breeding program, American Samoa uses very few government support programs.

1. Guam

Government of Guam has two land lease programs intended for farmers. One program, the Land Use Permit Scheme, is a short-term program involving typically small lot sizes. Although intended for bonafide farmers, many of the lessees

either leave the land idle or use it for Sunday picnics (Guerrero, March 1978). The principal lease program is administered by the DOA (Public Law 9-117) and applies to leases of up to 50 years, renewable every ten years. Maximum parcel size is 16 acres, and as an incentive, the lessee may be exempted from paying rent for the first five years. Most land available under this program has been in the northern region of Guam, where there is a concern about any activities that could harm the underground water lens. This area also has experienced the most impact from increased urbanization. Thus far, the potential agricultural lands in southern Guam have not been available for lease, primarily because of lack of clearing, access, and other necessary support infrastructure.

Crop insurance, administered by GEDA, provides limited coverage to Guam farmers. Maximum liability per policy is $5,000, and coverage is limited to the hired labor, land preparation, fertilizers, insecticides, seeds and other expenses incurred in putting in the crop that is insured. Since storm damage is a recurring problem of some significance in Guam, a more adequate program is needed. Natural disasters are typically addressed after the fact by Government of Guam, or by the federal government, but a better crop insurance program would reduce risk to the individual farmer.

Under Public Law 9-42, farmers may qualify for a preferred rate on water from the regular municipal system. The charge is 31.67 cents per 1,000 gallons for the first 15,000 gallons. While only about one-third the regular commercial rate, water from the municipal supply still represents a significant expense to farmers. To become eligible for the low rate, farmers must file an application with the Guam Department of Agriculture. If irrigation is to make a significant contribution to expanding agricultural output, water systems specifically designed for irrigation must be built. Such systems should be able to provide large amounts of water at much lower unit cost, since water treatment and pressurized lines would not be necessary.

In the mid 1970s, territorial legislation was passed which established a fund to be used by the DOA to purchase crops from farmers, thereby assuming the marketing function and assuring an outlet for farm production. However, this program was not implemented at the time of the original legislation. Instead,

in conjunction with the recent (1980) establishment of an Agricultural Marketing Board, $50,000 was appropriated to carry out board functions. It is planned to to use these funds on a revolving basis to give assistance in marketing selected fresh produce. The aim is to develop an orderly system for marketing pole beans, cantaloupe, bell pepper, and tomato. An increased supply and improved quality of these commodities is anticipated, through the action of the marketing board.

The Guam DOA provides, at nominal cost, equipment rental for clearing, plowing and discing fields, veterinarian services for livestock producers, and the sale of quality swine for breeding purposes. The department also propagates and sells vegetable and fruit seedlings which it has developed for Guam environmental conditions. Management assistance is provided to the five cooperative associations, and the territorial government has made available the public market facility in Agana. Recently, an extension program for aquaculture farmers has been developed, and the department operates experimental/demonstration ponds along the Talofofo River in southern Guam. Post-larvae freshwater prawns imported from Hawaii were made available to five prawn farmers in 1979. The department also has assisted producers in establishing a Guam Aquaculture Association (Department of Agriculture, FY 1979 and 1980 Annual Reports).

2. TTPI

There are no government support programs for agriculture in terms of price supports or import controls. There are programs which make food available to many people at virtually no cost. Although this program was intended to feed only school children, many others are able to obtain this food. This tends to undermine incentives for farming.

Under the provisions of the Covenant, the CNMI is eligible for all categorical federal programs that are provided to the 50 states and to the other U.S. territories. However, no federal agricultural grants are available to the CNMI although they are subject to U.S. agricultural laws.

The USDA Food Stamp Program was to have started in January 1980, with the requirement that 25 percent of the food purchased with food stamps be produced locally. With 60 percent of the population eligible to participate and assuming local production can be expanded to meet this requirement, a significant boost to agricultural development could result.

3. American Samoa

Price support and subsidy programs have also not been used, due in part to the absence of commercial growers of significant volume, as well as a previously reported hesitancy to engage in any form of direct subsidy to individuals out of concern for impacting the traditional system.

The Territorial Government has occasionally placed restrictions on the import of traditional foods as a means of supporting local producers. The territory does not participate in the Federal Government's food stamp program. Resistance to such participation in the past is related to the same reasoning which applies to other forms of federal subsidy, aid, or support programs. However, it appears that the Territory is seriously considering participation at this time. There are several factors which justify a change in position toward such federal assistance programs:

The dollar economy has been in force in American Samoa on a wide-spread and accepted basis for almost 40 years.

The impact of the new economy on the traditional matai system is fairly widespread and conclusive.

The average Samoan wage earner spends more than 50% of his income for food.

Income limitations, purchasing and consumption habits do not provide for a protein-adequate diet.

Given the present low level of agricultural production, it would be most difficult for the Territory to meet the FDA requirement for local production of food to be eligible for the food stamp program. Activities which may contribute toward the 25% local production requirement are: (1) taro which is locally grown and exported; (2) pork production which is presently supplying the hotel, restaurants and special functions; (3) eggs and poultry; (4) bananas, vegetables and other crops.

H. Agricultural Infrastructure

All the territories included in this report need to improve their agricultural infrastructure. Chief among them are irrigation systems and storage facilities.

1. Guam

Currently, some farmers irrigate their land on a very limited basis. Water is drawn from public, potable drinking water supplies, and although farmers

have access to a subsidized rate of 31.67 cents per 1,000 gallons (for the first 15,000 gallons), this represents an expensive source of water for farming. Recently the Government of Guam has indicated that an islandwide study of alternative water systems for irrigation will be done, and in FY 1982 a half million in funding ($300,000 in Federal Economic Development Administration funds) will be committed to implement a recommended system. The proposed project would entail the construction of small dams or reservoirs, channeling, impoundments, and delivery systems. Given the relatively modest projected funding for such an inherently expensive type of infrastructure, the amount of acreage to be irrigated will be limited.

To farm much of the relatively more fertile lands in southern Guam, access roads will be needed. Several new road segments have been under consideration. These include the following: (1) an Inarajan to Quinene Road, (2) the Agfayan to Route 17A, and (3) the Agfayan to Route 2 roads. An all-weather 1.3 mile road to connect Route 4 with the new Agricultural Experiment Station at Ija is receiving top priority. Federal Economic Development Administration (EDA) funding of $165,000 is budgeted to help meet the estimated total cost of $275,000. This road would not only provide access to the experimental station, but it would serve this proposed southern Guam agricultural park, and also permit access to other currently unutilized privately owned lands (Guerrero, March 1978, and Guam Department of Commerce, June 1980).

Typhoon Pamela destroyed the farmers' market in Agana, and afterwards a temporary structure was built at the Paseo de Susana. The public market not only handles fruits and vegetables, but also marine products and freshly prepared local foods which are sold mainly to tourists. Storage, refrigeration, handling facilities, and display areas are not considered adequate for accommodating an increased volume of farm production.
The report, A Public Market Feasibility Study, contained recommendations for a new public market facility, which would incorporate freezer, cold storage, and loading/unloading capacities. This study also concluded that a new public market facility would benefit the existing cooperative associations, which presently lack adequate storage and handling capabilities.(Sohn, July 1977).

At the present time, virtually no processing facilities exist in Guam. The absence of such infrastructure is considered by most observers as a major obstacle to increased production, a more orderly marketing system, and to a reduction in the risk of farming.

Processing facilities identified as being needed include a fumigation and food processing plant, a swine slaughterhouse, a poultry processing plant, and a prawn hatchery.

A food processing plant potentially would provide an outlet for surplus fruits and vegetables, and thus could lead to a more orderly marketing process. Fumigation of selected commodities is needed to meet Japanese and United States importation requirements, and thereby permit the export of these commodities. A pre-design feasibility study has been initiated by the College of Agriculture and Life Sciences (CALS), University of Guam (Guam Department of Commerce, June 1980).

As previously mentioned, pork consumption is quite large in Guam, with most of the market supply being imported. However, local production is significant (1.1 million pounds in 1979) and it is believed that if commercial slaughtering facilities were available, producers would increase production. A feasibility study was completed recently for the Guam Department of Commerce on a USDA approved slaughterhouse. However, site acquisition efforts have encountered resident opposition, and a private company has indicated plans to construct a slaughterhouse on a site located in Yona. If the private company proceeds with its plans, the Government of Guam will not establish the government funded facility (Guam Department of Commerce, June 1980 and August 1980).

In regard to poultry processing, the large egg industry in Guam necessitates the replacement of many older birds from the laying flock. Even though high feed costs keep Guam producers from competing in the market for broilers and fryers, there is a market for stewers. At present, this market is served through the sale of live chickens. If consumers could purchase processed stewing chickens from local producers, it is believed that sales would increase significantly. For this reason, CALS had recommended that the government assist in providing a smaller scale poultry processing plant (Guerrero, March 1978).

The commercial potential of aquaculture has been noted. However, the culturing of Malaysian prawn, one of the more promising candidates for commercial production, has not increased as originally expected because of the lack of an

on-island hatchery to supply post-larvae prawn. To establish a prawn hatchery, $450,000 in public works funding is being budgeted for FY 1981; $270,000 is to come from federal EDA grant monies (Guam Department of Commerce, June 1980).

2. TTPI

In general, there is sufficient groundwater for crop production in most areas, but the potential yield of freshwater is unknown because of the lack of groundwater wells to monitor the situation.

On Tinian, which produces more than 50 percent of the agricultural products exported from the Northern Mariana Islands, rainfall is adequate from April to December. During the dry season, from January to March, the farmers use 72 acres of government-owned irrigated fields in Marpo Valley on Tinian. The farmers are provided five to ten acres free of rent and water consumption charges.

On Rota, the water system which is used mainly for providing water to cattle, also allows adjacent farms to hook up for crop irrigation. Presently, twenty farmers have access to this line. A four-acre reservoir is also being planned.

On Saipan, a deep well was bored at the Kagman Station and services 35 acres farmed by eleven commercial farmers. Two additional deep wells will be bored to service 40 more acres of land being cleared which should accommodate 12 more farmers. A two-acre reservoir is also being dug.

Storage facilities in the Northern Marianas are barely adequate for present purposes. On Tinian, there are two chill reefers and one freeze reefer, which were constructed within the last 15 years. The Farmers' Market on Saipan also has chill and freeze storage which facilitates the marketing of local produce. A fresh produce storage facility is planned for development, but in general, storage facilities for fresh produce are still inadequate. Difficulties in transporting fresh produce from Tinian and Rota to Saipan have also limited growth of this sector.

3. American Samoa

Infrastructure development and the services that are available have been previously described. Very few of the infrastructural elements of the Territory were developed specifically to serve agriculture development needs. Part of the rationale given for the development of systems, such as the pioneer roads which serve the remote north shore villages, was to facilitate the transportation of agricultural produce to the populated south shore.

V. OFFICIAL DEVELOPMENT POLICIES AFFECTING AGRICULTURE

Federal and Territorial government policies in relation to agriculture are discussed in this section. Particularly in the case of the Federal government, a definite policy on agriculture is not apparent. The Territorial governments have indicated certain broad policy goals and have stipulated some specific policies to guide agricultural development. In both cases, more general public policies or those originally intended to apply to other sectors may have greater current or potential impact on agricultural development in the islands. The approach taken here is to attempt to identify all current policies which may have direct, indirect, or general effects on agriculture.

A. Federal Policy

How the U.S. administration deals with each island group is largely dependent on how the islands became U.S. territories and how long they have had that status. However, there has been recent Federal legislation which affects all territories.

In 1979, a presidential inter-agency task force was formed to examine United States Territorial policies. A principal outcome of the task force recommendations was the Omnibus Territorial Act of 1980 (P.L. 96-597). A key provision of the act was one which authorizes the Secretary of Agriculture to extend, at his discretion, programs administered by the USDA to Guam, the Northern Mariana Islands, the Trust Territory of the Pacific Islands, the Virgin Islands, and American Samoa, and authorizes the appropriation of funds, as may be necessary, to carry out this provision. Also under this act, U.S. territories became entitled to participate in programs under the Water Resources Act of 1974 (P.L. 93-251), the Departments of Energy and Interior, and other Federal agencies,

Subsequently, the Secretary of Agriculture responded to an inquiry from the Governor of Guam, citing programs of the Soil Conservation Service, Farmers Home Administration, Animal and Plant Health Inspection Service, Agricultural Marketing Service, and Federal Crop Insurance Corporation which might be utilized by the Territory, but also stressing the severe budgetary constraints imposed by the current Administration (letter from Secretary John Block to Governor Calvo, Aug. 5, 1981).

1. Guam

The Organic Act of 1950, together with subsequent amendments and occasional Congressional legislation in specific areas has provided the official basis for United States-Territorial relations. In practice, the U.S. Departments of Defense and Interior have been the primary vehicles for the expression of Federal policy. This usually occurs when the Territorial government undertakes particular programs or projects which require Federal funds or agency action (Navy land for harbor development, for example). In such cases, the Department of Interior or Defense must respond in some manner; it is the degree of response (or non-response) that typically reflects federal policy.

Direct expressions of United States policy with respect to agricultural development in Guam have been negligible. In terms of specific problem areas resulting from Federal policy, those that affect agriculture are generally the Jones Act, policy on temporary (H-2 Program) alien workers, CAB air transportation agreements affecting air service for Guam, and certain United States tariff code regulations affecting Guam exports to the United States. Of relevance to agriculture are several other programs previously mentioned. These are the food stamp program and the extension of certain United States agricultural programs to Guam.

The Jones Act (Section 27, Merchant Marine Act of 1920), which requires that goods shipped between the United States and Guam be carried in ships of United States registry, has been the subject of much controversy as to its effect on transportation costs for imports to Guam. Although it is contended that these charges are higher than if foreign ships were permitted to carry this cargo, the findings have not been conclusive that exemption of Guam from the Jones Act would be beneficial. In any case, the prospects for agricultural development in Guam probably are not affected significantly, whether or not this act is modified or eliminated.

Air service to Guam has improved and the application of CAB regulations and bilateral air agreements previously detrimental to better service have been modified. With airline deregulation expected to continue, and completion of the new international air terminal, Guam should have ample service in the future.

While United States tariff regulations affect the prospects for light manufacturing and trans-shipment in Guam, their effect on agriculture is probably negligible. However, in regard to importation of H-2 workers, United States

policy could affect Territorial agricultural development. Although small in absolute numbers (less than 100), temporary aliens accounted for about half or more of the hired workers in agriculture in the mid-1970s. It is understood that the United States Labor Department now prohibits the entry of H-2 farm workers to Guam (Guam Department of Agriculture, January 1980). Unavailability of this source of farm labor could discourage the initiation of larger scale commercial farm operations (Guerrero, March 1978).

The food stamp program is quite large in Guam. It has been noted that in 1979 there were 3,547 households with 18,065 individuals in the program, on an average monthly basis. This represents about 22% of the total number of local residents and temporary aliens (83,000 in April 1980) on the island. The food stamp bonus amount came to $11.1 million in 1979. Also, the USDA reported that 1.2 million pounds of food (meats, fruits, vegetables, grain, and dairy products), mostly imported, were distributed in Guam in the school lunch program (USDA Western Region, February 1980). It would appear that an opportunity exists to use these programs to provide market incentives to Guam farm operators.

2. TTPI

Throughout the U.S. administration of the Trust Territory of the Pacific Islands, the emphasis has been on the social and educational welfare of the islanders; support for agricultural development has not been very strong. Saipan, being the former headquarters of the TTPI, has enjoyed even more of the benefits of urbanization in terms of infrastructure, government jobs, and western influence. Therefore, although the island may have the most potential for expanding their agricultural sector, it may also have the least motivation.

The TTPI are eligible for many USDA programs as specified in the Omnibus Territorial Act of 1980 and elsewhere, but have not yet participated in them to any perceptible extent. Some programs obviously are not applicable; some may be too costly to maintain; others may not be needed for the volume of production currently marketed. Many of the conservation and research programs have not been made available to the territories, e.g., Technical Information Systems; there is no Soil Conservation Program in the CNMI, although it is present in the rest of the TTPI. Programs which the TTPI have participated in are primarily food distribution and nutritional programs. Implementation of the Omnibus Territorial Act of 1980 would probably be the most feasible present means of assisting the islands in meeting current developmental objectives.

At present writing, some of the TTPI (e.g., Marshall Islands, Belau) are engaged in negotiations with the U.S. government concerning their future political status. Generally, the prospects are for local island administration of internal affairs and Federal responsibility for defense and foreign relations. Grants-in-aid for future development are included in the negotiations, and agreed-upon purposes and amounts will be crucial in meeting agricultural development objectives.

3. American Samoa

The absence of Federal policy toward agricultural development in the affiliated Pacific islands is probably no where more evident than in American Samoa. This official disinterest has also been reflected in the past attitude of the Territorial government.

As has been mentioned, price support or subsidy programs have not been utilized. Nor has the Territory participated in soil survey, crop insurance, marketing, or other farmer assistance programs. Federal disaster relief was provided following the 1966 hurricane. The Territory has not participated in direct poverty relief programs such as welfare payments or food stamps, deferring to local perceptions of these programs as demeaning or inimical to the traditional family system.

On the other hand, American Samoa has progressed substantially in basic infrastructure development, with probably the most adequate road system among the Pacific islands and modern harbor and air terminal facilities. Although construction of these facilities was motivated by security, strategic, or other considerations, they represent undoubted assets for any future agricultural development. As in the case of the other areas, implementation of the Omnibus Territorial Act of 1980 can be instrumental in furthering such development.

B. Territorial Policy

1. Guam

Since 1975, the Government of Guam has promoted the concept of a "green revolution," and thus has given a high priority to agricultural development. The 1980 Overall Economic Development Plan (OEDP) for Guam identifies agriculture as one of four "lead" sectors, along with tourism, commerce/manufacturing, and fisheries (including aquaculture).

In 1978, the Bureau of Planning published two planning documents, The

Five-Year Economic Development Strategy, Territory of Guam and Agricultural Development Plan for the Territory of Guam. The former report contained a brief section on an agricultural development strategy for Guam, while the latter report, prepared by the College of Agriculture and Life Sciences for the Bureau, discussed problems in agriculture, made projections for selected crops, and included recommendations for the development of field farming. Neither report dealt with the problems of plan implementation, or included comprehensive budget proposals for achieving recommended actions and production targets. Nevertheless, these reports, along with the 1980 OEDP, constitute the primary basis for what may be interpreted as the agricultural policy of the Territory of Guam.

Perhaps the most explicit and comprehensive statement of agricultural development goals, objectives, and policies is that presented in the 1980 CEDP, and quoted as follows:

Agriculture

1. Goals
   a. Make Guam less dependent on agricultural imports.
   b. Promote the exportation of agricultural products.
2. Objectives
   a. Reduce the cost and upgrade the quality (freshness) of agricultural products
   b. Improve the economy of Guam.
      (1) Reduced imports results in more money for the local economy.
      (2) Increased agricultural activity results in increased employment opportunities.
      (3) Exports will strengthen the economic base and diversify the economy.
3. Policies
   a. Increase field farming and hydroponic production of fruits and vegetables in selected areas for selected varieties of crops, where it is economically feasible.
   b. Discourage the importation of crops which are being produced locally or could be produced locally at competitive prices.
   c. Encourage large-scale agricultural operations through long-term government leases of prime agricultural land.
   d. Promote cultivation of specific crops in districts or areas where they are most suited.
   e. Provide support infrastructure for identified agricultural development areas
   f. Encourage the construction of a fruit and vegetable processing facility.
   g. Promote the production of livestock and poultry.

(1) Produce feed locally.
(2) Provision of a slaughterhouse.
(3) Feasibility studies on raising livestock.

h. Improve the marketing and distribution program for agricultural products.

i. Intensify the activities of the Cooperative Extension Service and the agriculture experiment station of the University of Guam.

j. Credit assistance should be gradually shifted from supporting subsistence operations to promoting commercial agricultural ventures that offer a greater contribution to the economy.

With respect to specific commodities, the main thrust of government policy has been toward expanding the production of fruits and vegetables, pork, chicken meat, and the culturing of freshwater prawns. Cucumbers, watermelon, yard beans, and eggplant, among the fruits and vegetables, are considered to be productive and suitable under local conditions (Guerrero, March 1978). The Guam Agricultural Experiment Station has concentrated on determining the adaptability of eggplant, Chinese cabbage, bell pepper, head cabbage, and tomatoes (Experiment Station Annual Reports, 1976-1979), while the Agricultural Development Plan recommended the expanded cultivation of eighteen fruit and vegetable crops: pole beans, radish, sweet potatoes, tomatoes, taro (two types), bittermelon, cantaloupes, papaya, pineapple, zucchini, avocadoes, eating bananas, Chinese cabbage, head cabbage, corn, green onions, and bell pepper (Guerrero, March 1978).

Recent policy on marketing and promotion has emphasized improving the supply and quality of fruits and vegetables coming to market, and promoting volume sales via the cooperatives to the military, restaurants, and other potentially large purchasers. A recent appropriation of $50,000 was given to the government Marketing Board to increase the supply and quality of pole beans, cantaloupe, bell pepper, and tomatoes to the local market.

Government of Guam resource policies currently emphasize water development. Plans and policies dealing with labor and capital for the agricultural sector have not been well articulated, or have not changed from the early '70s.

While the availability of irrigation water has been a recognized need for some time, past government policy has focused on providing subsidized, low rates for farmers using the regular municipal water system. Since, even with the subsidized rate, such water is expensive, and often not available during dry weather periods, little irrigated cultivation has occurred in Guam. However, Federal monies, along with Territorial matching funds, have been requested for an island-wide study of alternative irrigation systems, and for implementation of the recommended system.

To meet seasonal demands for labor, the government of Guam is favorable toward bringing in foreign farm workers under the H-2 temporary alien program. However, the U.S. Labor Department has apparently stopped the entry of such workers, although still permitting some H-2 workers to enter or remain in the construction industry. No specific policy or plan for developing indigenous agricultural labor force skills is evident. The Guam Community College is reported to be planning an agricultural curriculum, and a Comprehensive Employment and Training Act (CETA) program to train several individuals in fruit orchard production is presently underway at CALS (Guam DOA, personal communication, January 1981).

As discussed in a previous section, three Territorial government programs provide loans to farmers, but resources have been very limited and amounts and number of loans actually made have fallen short of demand. Explicit plans and policies are not evident in the capital area, except for aquaculture. Based on study findings, $1.2 million in Federal funds have been requested for an Aquaculture Revolving Loan Program (Department of Commerce, June 1980).

With respect to the land leasing programs, the official policy is to discourage short-term leases (land used under government permit), and concentrate on long-term leases, especially within recommended agricultural improvement districts (Bureau of Planning, August 1978; and Guerrero, March 1978).

Present Territorial policy stresses the provision of physical infrastructure to remove constraints to the expansion of agriculture. In practically all the projects recommended for construction, it is anticipated that Federal funding will defray up to 75% of the costs. The more significant projects in agriculture are the following: Ija commercial agricultural park development plan ($200,000), Ija access road ($275,000), swine slaughterhouse ($400,000), study and implementation of an irrigation system ($585,000), prawn hatchery ($450,000), and the aquaculture revolving loan program ($1,200,000). Several of these projects, if begun, imply the probable future commitment of substantial amounts of funding. These are the Ija Agricultural Park in southern Guam, the irrigation systems project, the prawn hatchery, and possibly the slaughterhouse.

The Ija Agricultural Park would include such infrastructure as fumigation, processing, packaging, and storage facilities. Prior Federal funding has been used to complete a pre-design feasibility study for a fumigation and food processing plan. One of the primary motivations for the fumigation plant is to

enable certain Guam crops, such as melons and ornamental plants to be exported to the Japanese market (Department of Commerce, June 1980 and August 1980).

The major constraint on this infrastructural development program is the uncertain status of the U.S. Economic Development Administration (EDA), through which the Federal funds are being requested.

Government of Guam expenditures for agriculture are primarily handled by the DOA and the University of Guam, CALS. Department of Commerce, Bureau of Planning, GEDA, and some other agencies contribute personnel and some funding (mainly matching contributions for federally funded projects).

Outside of the relatively small farm loan, crop insurance, and water rate subsidy programs mentioned previously, there is not much in the way of financial assistance to the agricultural sector. The land lease program potentially could be a major means of support to the extent that infrastructure investment actually opens up new lands, and attractive lease terms are offered.

Presently, there are no crop price supports, import duties or quotas on food items, and no government subsidies on agricultural inputs. However, the DOA does provide some services and seedlings for sale at nominal prices. Also, some support is extended the cooperative associations, and public market facilities in Agana are provided.

Policies and plans with respect to research and development, as in other areas of agriculture, are not clearly defined. It appears that the main thrust has been toward identifying and adapting selected vegetable crops to Guam conditions. Research has also been directed toward soil conditions and protection from insect and diseases affecting the screened vegetable varieties. Programs in animal science, agricultural engineering, land use, aquaculture, and economics are all relatively new. Just as in the case of physical infrastructure development, there seems to be a heavy reliance on federal funding. Research and development funding may be available under Section 406 (P.L. 89-808) of the Food for Peace Act of 1966, Section 22 of the Water Resources Development Act of 1974, Soil Conservation Service, the Land Reclamation Act of 1902, and other federal programs for which Guam has recently become eligible (Guam Agricultural Experiment Station, 1979).

2. TTPI

Because of the changes being made in the TTPI's political status, new developmental plans are being drafted; therefore, no current plans for the islands in a free association status are available. However, a review of previous plans may be enlightening to the extent that planning documents can provide the basis for developmental policy. As indicated, a fuller commentary on the content and quality of agricultural development planning in the Pacific islands has been presented as an appendix to the USDA report.

Past priorities for the Marshall Islands have included infrastructure development, particularly new airports on other atolls; copra re-planting to reverse the decline in production; fishing; tourism; and agricultural self-sufficiency and increased food variety. Although agricultural self-sufficiency is a priority item, little activity is apparent and there is presently no agriculture development plan as such. The two major agricultural research projects are one run by the Taiwan government, which focuses on garden-style agriculture, intercropped among the coconut trees; and the other is a U.S. forestry service project designed to determine what type of trees grow best in this environment.

Belau has the greatest land resource in relation to population, and with very few prospects in other sectors, cannot afford to ignore agriculture. The development objectives in the 1977 plan call for increased production to meet local demand, generate an eventual export surplus, and create productive jobs for a growing labor force. Indicated policy directions are to ease constraints on use of labor, transportation and marketing, so that available land resources and technology may be utilized.

Past objectives for the various districts of the Federated States of Micronesia have included:

1. development of underutilized resources for maximum production and to concentrate on income producing sectors;
2. becoming self-sufficient in food production;
3. encouraging surplus production of agricultural and marine products for export;
4. creating new employment opportunities;
5. checking out-migration of the young and educated;
6. preserving traditional life styles;
7. expanding the cash economy.

Although these islands have few other economic opportunities, the actual implementation of agriculture-oriented plans has been very minimal. The local governments seem presently more concerned with developing the physical infrastructure.

Although the importance of agriculture to the economy and the lifestyle in the Northern Marianas has been recognized, proposed economic strategies give almost no attention to agriculture. The neglect of agriculture is further evidenced by the small appropriation of funds to the Department of Natural Resources and with most of the funds slated for beautification projects. Agriculture was not given much attention in the Strategic Development Plan, but a separate Agricultural Plan which was to be completed in 1981 may provide additional information. Infrastructure development is a high priority objective for the CNMI; but most of the development is directed toward social infrastructure--schools, housing, etc. New roads, water meters, power distribution systems are anticipated for the district center area. Port construction is projected for Saipan, and Tinian in the middle and late 1980s. The planned expansion of irrigation systems on Rota, Tinian and Saipan is a recognized need for the future growth of agriculture, but no funds have been projected for these activities during the years covered by the plan.

3. American Samoa

The planning and implementing of agricultural activity as suggested in the preceding sections, have not been a significant part of the Territory's economic development program. However, the government, aware of the population's dependence on food imports and the significant outflow of cash that results, has given increased attention to the need for import replacement and substitution. This objective was stated in the Economic Development Plan for American Samoa, FY 1979-1984. Further recognition of this need is found in the Territory's Overall Program Design, an annually updated document which is prepared in part to comply with the Economic Development Administration 302 planning grant. A more comprehensive document outlining the Territory's development needs and proposing a new agricultural development fund was presented at the Pacific Basin Development Conference (PBDC) in Honolulu in February, 1980.

The in-place infrastructure and resource base of the Territory in terms of transportation (both over land and water), energy, and water are perceived as being adequate until such time as an agricultural development program is defined and pursued. Should commercial farming become an important program objective, it would be necessary to improve and surface the "pioneer" road system which presently connects the north and south shores so that they are "all-weather" roads. Should export crops be identified, it would be necessary to improve and expand the capacity of the Port of Pago Pago.

Territorial land policies have been devised to assure the preservation of native lands; only Samoans with at least 50% Samoan blood may own land. Native communal lands associated with a specific chiefly title are owned by an extended family but are taken care of by the holder of that title. The land may be surveyed and registered in the name of an individual Samoan following registration and posting of the parcel.

These policies are not expected to pose obstacles to future agricultural development. Native individual land may be sold to another Samoan. Also, any native lands may be leased following approval of the land commission and the governor and barring any objections of legitimate claimants to any lease. The lease period for native lands was recently extended by local legislation to a period of 55 years.

VI. POLICY IMPLICATIONS FOR AGRICULTURAL DEVELOPMENT

This concluding section returns to the premise which underlies the fuller report from which this publication is drawn; namely, that Pacific islanders, with their newly-emergent political status, desire to progress economically in ways that will not cause them to abandon their cultural heritage; and further that a program of accelerated agricultural development, given their physical and social environments, may be the most pragmatic and meaningful approach to meet these aspirations. The preceding sections of this report have pointed out both potentials and difficulties for the American-affiliated Pacific Islands as a group and for each major political unit within this group in striving to attain these developmental objectives.

The principal factors constraining agriculture in these islands have previously been indicated and may be summarized as follows: natural and ecological constraints, limited availability of land, limited availability of water, physical infrastructure deficiencies, scarcity of key inputs--capital, skilled labor, equipment, fertilizers, etc., small size of local market, distance from overseas markets, lack of market incentives, inadequate institutional support, a generally negative attitude toward farming as an occupation or vocation, and government policies which are inappropriate or inadequate for promoting agricultural development.

These difficulties or constraints are indeed formidable and pervasive. The extremely small scale and limited development of agricultural enterprise in the Pacific Islands attest to the persistent prevalence of these restraints. Mention has been made of various policies, official and non-official, which have affected or may affect growth in this sector. Such policies include not only legislative and administrative actions which may have direct or indirect influences on agricultural development, but also the resources and technologies, financial and infrastructure requirements, and social and economic institutional changes required to bring about the desired direction and pace of growth in these islands.

Assuming the initial underlying premise is still valid and acceptable, then major policy changes will be required to alleviate and overcome the identified constraints so that island aspirations and objectives may be realized. Suggested policy approaches to deal with these difficulties

are presented here for the islands generally. More specific recommendations for each of the political units are given in the larger study. To significantly raise agricultural production from its present low level and sustain growth along a desired course of development, progress must be achieved incrementally and in a variety of areas. The term "coordination" has probably been overworked in the development literature, but for these islands, there is no more apt description of the tasks ahead.

A. Land and Water Policies

Effective land use controls together with appropriate property tax policy for agricultural land are needed. The imposition of controls would facilitate an increased availability and use of private land for farming. However, their effectiveness is premised on success in raising productivity for targeted crop and livestock commodities and thus the overall profitability of farming.

As farm production and profitability rise, an increased demand for agricultural land will occur. To the extent that idle private land suitable for farming exists, land sales or leases should be directed toward new or existing farmers or expansion of present farm operations. Implementation of effective land use controls may need to be supported by appropriate tax policy. In contrast with prevailing practice in many developed areas, preferential treatment should be extended through more favorable rates on higher productivity land areas.

To increase the efficiency of the present real estate market and thereby facilitate the transfer and consolidation of parcels for agricultural use, the present situation with respect to land titles and surveys needs to be clarified and updated.

As warranted by the demand for land to be used for commercial production of crops and livestock, government-leased land should be made available on a long-term basis and in sufficient parcel size (consistent with the intended commodities to be produced) to enable profitable farming. Adequate criteria should be used to screen applicants, and

lease rents should be reasonable in light of anticipated returns (or set in terms of a percentage of gross revenues).

Water and irrigation systems are needed to increase productivity, but the very high cost involved must be justified in terms of anticipated actual usage and the yield increasing benefits to be derived. Given the geographic distribution of existing farms and location of surface waters that are likely to be tapped, such irrigation systems may only be justifiable in terms of opening up new land areas or in conjunction with the planned development of agricultural parks.

B. Research and Development

A development approach focused initially on the small, family operated farm has implications for research and development (R&D) and other policies related to land, labor, extension, and institutional arrangements.

A prerequisite to increased agricultural output and productivity is an accelerated effort to develop appropriate packages of practices for those commodities determined to have the best commercial potential. This was stressed at the outset of the report and has been reinforced through preparation of the island profiles. Both tasks--determining which commodities to assign high priority for development, and the development of the high productivity packages of practices--are critical and warrant expanded support.

Drought conditions during the dry season and the high cost of factor inputs such as chemical fertilizers and pesticides which must be imported, would be taken into consideration in developing suitable crop varieties. Although there is a need for irrigation systems, development costs will be high and competing urban needs will tend to keep water expensive.

In terms of operational or farm-level research, the present level of effort appears to be small, which may be partly the consequence of too few resources and expertise devoted to extension activities.

Significant opportunities appear to exist for the University of Hawaii to provide assistance to Guam, TTPI and American Samoa in agricultural research and development. The UH-CTAHR has a wide range of expertise and many facilities which are lacking in the islands -- particularly at the strategic and basic levels of research. It would be cost-effective for the USDA to support cooperative research and development endeavors in those cases where the islands have identified problems or opportunities calling for CTAHR assistance and where mutually satisfactory arrangements can be worked out.

C. Market Development

The small market and present disorganized nature of the marketing system have been identified as major restraints. Several areas need to be addressed: (1) organization and administration of cooperatives or producer associations, (2) quality standards, (3) marketing information and production planning, and (4) price supports or other market intervention schemes to stabilize prices.

Increased government or private technical assistance is needed to strengthen the organization and administrative functioning of the existing cooperatives. If this is not feasible or acceptable, new organizational structures should be considered. Collective management of the supply and quality of commodities destined to retailers or to consumers via the public market is essential. Farmers must have confidence that cooperatives or associations will obtain best average prices over the long run and provide higher returns than if the marketing of crops were undertaken individually. Authority to represent members and negotiate commercial contacts with buyers should be delegated to coop management in accordance with agreed procedures.

With increased production of specific commodities, the formation of commodity associations should be encouraged. Focusing attention on a single commodity results in private resources being mobilized in support of the industry. The commodity or industry association represents an interest group which can efficiently communicate concerns to government policy-makers and researchers.

The development and enforcement of commodity quality standards is essential in capturing a larger share of market demand in the face of import competition. Industry - government cooperation will be necessary in setting and enforcing standards.

Crop production forecasts and market price data communicated on a timely basis to farmers and farm associations are needed to support the management of market supply. Farmers should understand the use of such information and the importance of crop scheduling and supply management.

Price supports, or other forms of market intervention to stabilize or temporarily raise prices received by farmers may be called for in the case of selected commodities. These are the commodities which have demonstrated that they are cost competitive with imports on the basis of average market price, or for which high productivity packages of practices have been developed, but require price incentives to insure adoption by farmers.

Facilities such as storage, refrigeration, handling, packaging, and processing, contribute to evening out market supply, improve quality, reduce spoilage losses, and to a wider market for locally produced commodities. To the extent these facilities can be profitably utilized, they should be afforded highest priority.

If sustained growth in agriculture is to be attained, export markets will have to be developed. This should be considered a long-run task. Although it is important to identify and undertake developmental work on potential export commodities, priorities in the short-run should be on increasing productivity of those selected commodities determined to have the highest potential in terms of local market demand and comparative costs vis-a-vis imports. As the productivity and profitability of agriculture rises, private initiative should begin to focus more on export possibilities, reinforcing the public sector work in this area.

D. Institutional Support

Private institutional participation in island agriculture is minimal, a consequence of the relatively small size of the sector. For this reason, a heavy burden is placed on public institutions to initiate growth. To begin and sustain agricultural growth, the structure of programs and their administering institutions should be appropriate to the immediate tasks; that is, working with small, largely family operated farms to raise productivity. As previously discussed, this involves developing high productivity packages of practices for selected crops and livestock and ensuring their adoption.

Increasing productivity for the targeted commodities will require a major extension effort to ensure adoption of the packages of practices that are developed.

Hence, an adequate number of extension agents with appropriate technical and communications skills will need to work and interact with farmers. Extension agents should be involved in the operational or farm-level research, as well as tactical (experimental station) research which is undertaken to develop the high productivity packages of practices. It should be the extension agent who bridges the two-way communications gap between researchers and farmers. Participation in the research and feedback on results is critical to the success of these efforts, i.e. attaining both high productivity and adoption.

In terms of education and training, loanable funds (capital), water, crop insurance, soil conservation, and other resources and services, the present institutional arrangements and programs need to be evaluated in light of the immediate tasks and applicable target groups. Program adequacy should be assessed, overlap or redundancy in services eliminated, and new programs as feasible and required initiated. Each of the distinct programs (or services) should be examined to ascertain the extent to which it provides adequate incentives, services, or reduction in risk. This needs to be done with explicit involvement and consideration of small farmers.

E. Government Policies

An explicit federal agricultural policy with respect to these territories has not been evident. Federal programs and financial assistance have stressed physical and social infrastructure and general financial support to the territorial government. Relatively little of the funding has gone into agricultural development.

With about 90% of all civilian food being imported, plus an unknown but large amount of food for the military base in Guam, much greater support of agricultural development by the federal government is warranted. Food prices have been increasing significantly faster than the general price level (as measured by the Consumer Price Index in Guam). Given the heavy dependence of these economies on Federal expenditures and direct financial support to the Territorial governments, added cost of living pressures from more expensive food imports are likely to be translated into increased demands for Federal financial support. On the other hand, successful agriculture development, although entailing a significant level of investment, in the long run would result in less dependence on Federal assistance.

Federal support of agricultural development can focus initially on the following areas: (1) extension of those USDA and other agencies programs which assist farmers in other states, but are not currently applied to the territories; (2) changes in the school lunch and food stamp programs; (3) increased direct assistance for agriculture infrastructure development; and (4) increased assistance for research, development, and extension activities.

As indicated, the Omnibus Territorial Act of 1980 authorizes the extension of USDA and other programs to the U.S. Pacific territories. Programs such as soil conservation, crop insurance, and farm loans (several programs) would benefit the islands by reducing the risk of farming, providing capital, and generally reducing resource costs or contributing to higher productivity (cutting crop losses by insect eradication programs, for example).

In regard to the school lunch program, presently the more than one million pounds of food distributed annually are from the mainland. Many of these foods could be supplied locally. Two problems could be anticipated: first, obtaining funding authority to purchase locally produced commodities to distribute to the schools may be difficult; and second, much of the distributed foods are now canned or processed and substituting fresh for processed foods may present logistical and other problems for the program. However, the anticipated economic benefits to island farmers would warrant the effort required to make the changes. Also there would be opportunity to upgrade the nutritional value of foods going to the schools.

Similar advantages may be cited for the food stamp program. Mention has previously been made of the possibilities for extending the proposed 25% local production requirement for the Northern Marianas food stamp program to the other territories. This action would at least offer additional potential for agricultural growth.

Currently, it appears that practically all capital investment in physical infrastructure for agriculture comes via the federal EDA program. As this program is in process of being reduced nationally and probably for the territories, alternative sources of increased direct capital assistance to agriculture will need to be found. As previously noted, priority should be given to facilities which strengthen the marketing and distribution system and which contribute to providing wider markets or additional income opportunities through expanded sales to processed food outlets.

F. Planning Process

For the Pacific islands, a more productive agriculture can make substantial contributions to such goals as: improved nutrition, more equal income distribution, increased job opportunities, increased living standards, better economic security, and an improved ecology. To realize any of these goals implies an increase in overall agricultural production. To ensure that such increase contributes to other specified goals requires an effective planning process. An effective planning process in turn includes an adequate set of attainable objectives, an appropriate development strategy, provisions for implementation, and a consistent financial plan or budget.

Agriculture planning, like planning for other sectors, may be divided into major phases or steps. Different people would describe these components differently. The following basic outline is suggested. First, a baseline description of the existing and projected situation should be provided. This would be the section in which most of the statistical data would be reported. Second, an analysis should be offered to say what are the problems regarding the situation. Different observers, bringing different values to the situation, are likely to see different things as problematic. Third, there should be some formulation of objectives based on what is regarded as problematic in the situation. Explicitness with respect to objectives helps to clarify the major values of concern. Fourth, there should be programs (actions, projects, strategies) proposed to serve as the basis for fulfilling those objectives--that is, for responding to the problems--in the concrete situation. Fifth, there should be provisions for implementation, saying who is to do what to carry out the proposed programs.

On the basis of these five categories, the major observation to be made after review of various island planning documents is that there has been very little agriculture development planning for the American-affiliated Pacific islands. In some of the economic development plans, agriculture receives little more than a passing mention. It appears that there has been little sustained study of the problem of agricultural development in the islands.

On the other hand, there is great variety in the structure of the

development plans for agriculture. Some provide very extensive background descriptive information on the current agricultural situation, while others give only cursory accounts. Some follow the background directly with recommendations for particular activities, while others provide a discussion of alternative approaches, and an explanation to show how the final recommendations were obtained. Some simply state objectives, while others also explain how objectives were formulated. Some (like the overall plan for American Samoa) are very good about explaining which agency is to be responsible for each of the recommended activities. In contrast, some (like the plan for the Marshall Islands) simply say that certain things are to be done, with little indication of how or by whom. There are very great differences in the way in which each of these elements of the overall plans are completed. The differences are in part attributable to differences in purposes among the planners, and in part simply to differences in style. On the whole, however, it seems fair to say they represent real differences in quality. The published plans are very uneven in their coverage of the major phases of the planning process.

The basis of this review is that agriculture development plans ought to have at least some accounts of the situation, the problems, objectives, programs, and implementation schemes. Of course, these expectations should not necessarily apply where the intention was not to prepare a plan. Frequently, however, the intentions are unclear, so it is difficult to know what standards of assessment are relevant. For example, how does the Northern Marianas' document on development <u>strategy</u> differ from what would have been expected if it had been identified as a development plan?

The view here is not that there is anything intrinsically wrong with the approaches to agriculture development reflected in the plans, but that, in each case, it would be useful to broaden the range of vision, taking other possibilities into account beyond those reflected in the plans.

Ideas on how planning perspectives might be broadened can be drawn from published studies and from conversations with specialists in a variety of fields. Since some of the agriculture development problems and potentials of the American-affiliated Pacific islands are similar to those of the islands of the South Pacific, studies on their situations should be consulted

as well. A useful compendium, South Pacific Agricultural Survey 1979, Pacific Agriculture: Choices and Constraints, was published by the Asian Development Bank's Manila office in 1979.

One very important source of ideas is the plans themselves. Ideas that have proven fruitful in one Pacific island territory should be studied carefully in other island territories. The island planning offices might draw from one another's plans more than they do. Indeed, given the similarities of their problems, they should collaborate with one another more than they do.

One approach would be through regional planning for agriculture for the American-affiliated Pacific islands. Regional planning for agriculture in the American-affiliated Pacific islands could follow the models already established by the regional planning efforts for fisheries, energy, and tourism that are being coordinated through the Pacific Basin Development Council. Regional planning efforts can also provide an opportunity for establishing mutual support among the island territories in the formulation of their separate development plans.

The American-affiliated islands share many common concerns. In some cases, their interests are complementary, making it possible to benefit from cooperation. In some ways, their interests may be incompatible. They may compete in the production of similar products for similar markets, and they may compete in the race for federal support of various kinds. On balance, however, it appears that all of them could benefit substantially from more systematic cooperation.

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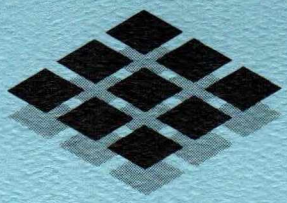

NOTE: As part of a structural reorganization, the Hawaii Agricultural Experiment Station and the Hawaii Cooperative Extension Service have been merged administratively under the name HAWAII INSTITUTE OF TROPICAL AGRICULTURE AND HUMAN RESOURCES, College of Tropical Agriculture and Human Resources, University of Hawaii.

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